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INDIAN FORESTER,

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FORESTRY,

AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

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THE

INDIAN FORESTER.

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Spread of Loranthus.

I well remember what a pest the Loranthus used to be among the sal forests of the Siwaliks and what a puzzle it sometimes was, in consequence, to know how to act. The Lakarkot Block of the Saharanpore Division used to be particularly bad in this respect and when the improvement fellings were being made there, it came to be a nice problem to decide which trees out of such a crippled lot to choose for reservation. Fine young patches of sal poles in many cases had every individual attacked by one or more of these parasites and the only choice left was to retain the least injured tree or the one whose leader, at any rate, was still intact.

These recollections of the jungles round Dholkhand came to my mind with great distinctness as I was listening not long ago to a paper on "The Dispersal of Mistletoe" in Australia, read before the Field Naturalists' Club of Victoria by Mr. H. P. C. Ashworth, the Honorary Secretary of the Club, and as I am sure it will interest the readers of the "Indian Forester," I enclose it. In the discussion which followed the reading of this paper one member stated that *Dicæum hirundinaceum* was common near the Gulf of Carpentaria, from which it would appear that the species spreads well into the tropics or has perhaps spread from the tropics down into the temperate regions of the South. There are several species of *Dicæum* in India, through *D. hirundinaceum* is not given in Jerdon and probably is not found beyond the Australian region. Some of these Indian species may in their habits resemble this particular Australian one and it is in the hope that somebody will make the necessary observations and settle the point, that I am now sending you these remarks. The supposition seems probable and is supported by the mention made in the paper of "banian" seeds being spread in this way, though I always imagined that green pigeons were the chief agents in dispersing the epiphytic forest figs.

Mr. Ashworth has very kindly lent me a stuffed specimen of *D. hirundinaceum* and a diagram of the Loranthus fruit, showing the opening made by the bird. I enlose a copy of the diagram and a rough, outline sketch of the bird life-size. In this species the head, back, wings and tail and the wing—and tail-coverts—are dusky brown shot with blue-purple; throat, breast and under tail-coverts scarlet; breast white, more or less clouded; beak and legs black. I believe no Indian *Dicœum* is marked much like this, but the general shape and appearance will be about the same and the characteristic beak. This last is short and though broad at the base, has a sharp point with a marked ridge running along the top from the base to the point.

Mr. Ashworth's observations were so careful and so complete that I do not think there is any room left for doubt as to the *Dicœum* being at any rate a very important, and probably the chief, agent in the distribution of Loranthus in Victoria. The spread of *Loranthus europœus*, as well as of the true Mistletoe, in Europe, is generally attributed to the missel thrush, but possibly furtner observation may show that other birds have a share in the work.

At any rate it would be interesting to know exactly what bird is answerable in the various part of India for spreading Loranthus through the forests, and whether it carries all species of the parasite indiscriminately or not. In Lakarkot, *Loranthus longiflorus* was the commonest, but not the only species, two or three others were, I think, also far from rare.

Even when we have this information, we shall still be far from a solution of the problem of getting rid of Loranthus, though it will be a step in the right direction. Dr. Hess, in his "Forstschutz" asserts it would be a mistake to shoot mistle-thrushes on account of their value as destroyers of insects. Curiously enough the *Dicœum* can claim a similar value. It is generally looked upon as insectivorous and belongs to an eminently insect-eating family.

MELBOURNE.
22*nd October*, 1895. } M. H. CLIFFORD.

From the August number of "The Victorian Naturalist," the Journal and Magazine of the Field Naturalists' Club of Victoria.

THE DISPERSAL OF MISTLETOE, BY H. P. C. ASHWORTH.
(*Read before Field Naturalists' Club of Victoria, 8th April, 1895.*)

"The wide prevalence of parasitic mistletoes high up in the branches of even our loftiest eucalypts is noteworthy, and although it has long been known that birds are the agents in dispersing the seeds, still the extent to which one small bird contributes does not seem to have been recognized. The bird referred to is the pretty little Swallow Dicæum, *Dicœum hirundinaceum*, which, so far as my observation go, seems to be the exclusive agent in Australia.

The general facts of the inter-relation of plants and animals are now fairly well understood, the broad deductions being that by the process of variation and natural selection all our brightest flowers have been evolved to attract insects to fertilize them, and our most delicious fruits to entice birds and mammals to eat them and disperse their seeds.

As an instance of the latter, Wallace cites the case of the nutmeg, which is eaten by fruit pigeons for the sake of the mace surrounding it, this latter being merely an adventitious growth to attract attention. The nutmeg passes throug the the bird's body and germinates where it falls.

In Europe, the chief agent in the dispersal of mistletoe appears to be the Mistletoe or Missel Thrush, *Turdus viscivorus*, the specific name of which, signifying "mistletoe eating," was given to it by Linnæus on that account; indeed, it was long thought that this bird was a sort of foster-parent to the mistletoe, and that the seeds would not germinate unless they had first passed through its body. The European mistletoe (*Viscus*) has a soft skin, and is eaten by the birds whole, but our mistletoes belong to the genus *Loranthus*, the seeds of which are encased in a hard berry, and the wonderful adaptation of the Swallow Dicæum to the *rôle* of extracting them is remarkable. The fruit of the mistletoe ripens about the month of May and the Swallow Dicæum then appears in large numbers. Intent on observing them, I set off one day with a telescope to the junction of Gardener's Creek with the Yarra, where there is a fine clump of box * trees, covered with mistletoe. After watching the birds for some time through the telescope, I found that they first plucked a berry then repaired to a larger bough, whence after a few moments the berry was dropped. I had always thought that the berry was eaten whole, but on picking one up the mystery was solved, for it was empty; the seed, with its glutinous covering, had been abstracted through an opening in the top, formed by biting it nearly through, leaving a lid. Nor is this all, for in the act of picking the fruit, a small hole is left where the stalk joined it and this must greatly facilitate the sucking or squeezing out of the contents. During the whole process the bird uses only its beak. The ground underneath each of the trees was strewn with several hundreds of these discarded berries, each with its lid at one end and the small hole at the other.

The bird is so small that when the seed is passed it sticks to the bough on which it sits, and is glued there by its viscid covering. On climbing the trees, I was surprised to find what a large number of seeds were sticking to the branches.

Consul Layard writing to "Nature" from Noumea (see Victorian Naturalist, Vol. V., p. 72), speaks of the Indian species of

* A species of Eucalypt. M. H. C.

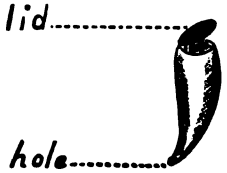
the genus Dicæum as the agent of dispersion of the banian, and says that the seeds require to pass through the bodies of the birds to enable them to germinate. To determine whether this holds with our mistletoes, I planted and marked a number of seeds on several trees. Two months afterwards, in July last, they began to sprout and send their roots into the wood of their hosts, and continued to grow equally as well as those passed by the birds. School-boys are fond of the berries for the sake of the glutinous covering of the seeds, which is very sweet, and suck them in exactly the same way as the birds.

The Swallow Dicæum is recorded from all parts of Australia, and its migrations are probably regulated by its food supply. I am convinced that in Victoria, where it only stays in any number for three or four months, it is the exclusive agent in the dispersal of mistletoe, and should be glad to hear from observers in other colonies the time of its appearance, and the extent to which it is noticed feeding on the berries.

NOTE.—The subject of the dispersal of the seeds of the many Indian species of *Viscum* and *Loranthus* is one of great interest, and we recommend its investigation to our readers. The genus *Dicæum* is rare in India, occurring only in Assam and Burma, so that other birds are probably concernedin the dispersal.

HON. ED.

Rough Sketch of *Dicæum hirundinaceum*.



Fruit of Loranthus after being opened by the bird.

The Treatment of Casuarina on Sand Dunes.

Casuarina equisetifolia has been grown to a very great extent, along the sea shore in the Alibág Range of the Kolaba Division and in the Dápoli Range of the Ratnagiri Division, and I am not aware that the Forest Officers who put down the seeds met with any special difficulty in getting them to grow. Perhaps those who sowed the seed will be able to tell us about this for I can find nothing about it on the records of this office. This tree has been grown in large numbers at several places on the sea shore, in some places as close as within five yards of high tide level, and though exposed to the full force of the South-West monsoon winds, and to the adverse influences of the sand, are not the least stunted in growth and are as good specimens of the tree as can be seen anywhere. The compound of my house at Alibág is full of well grown Casuarina trees, straight as an arrow and from 60 to 80 or 90 feet high, and they have been grown and are now growing, on sandy soil with sand all around them not more than 20 yards from high-tide level and with nothing between them and the monsoon winds. They must be about twenty years old now for I fancy they were sown when the Bungalow was built, and that is about the age of the Bungalow.

W. BETHAM.

CAMP DAPOLI.

II.—CORRESPONDENCE.

The Assimilation of Nitrogen by Tea Plants.

DEAR SIR,

Enclosed please find a contribution to your Magazine "The Indian Forester"—which I trust may be accepted. The vast subject of *cultivation* has received a deal of research from me within the last fifteen years.

Yours faithfully,

GEO. W. C. COCK.

Notes on "Assimilation of Nitrogen through the Agency of the Root Tubercles in certain Papilionaceæ."

[From The Dictionary of Economic Products Vol. V., No. 169 *a*.]

1. It is now a recognized scientific fact, that certain of the Papilionaceæ (called so because their flowers resemble the wings of butterflies) have the property of absorbing nitrogen, which sets up a disease on the rootlets in the shape of small nodules. In these nodules bacteria are bred.) When ripe, the nodules burst, and the higher plants—in our case tea—have the power to feed on those bacteria so set free.

2. For the above information we are entirely indebted to Dr. Watt, C. I. E.

3. Now, our object is to make use of this information.

The way we would suggest is as follows :—

Select a convenient spot near the Tea Garden, in Forest land if possible. An acre or so would do nicely. Prepare the soil as we do in making a Tea-seed nursery. When the land is ready, sow broadcast seeds of Saw, (*Albizzia Stipulate*) or Sensitive Plant, (*Mimosa pudica*), the latter appears to us to be more suitable, as the rootlets are swarming with those nodules.

4. At the same time a Saw nursery should be prepared. When the trees are a decent height they may be planted in the Tea Garden say 4S feet apart.

5. Now we come to what we consider of vital importance. The soil of the Sensitive plant nursery, after a few months, should be carried away and spead arround and below the Saw trees, which we have already planted in our Tea Garden, as it will be found to be simply impregnated with nitrogen bacteria. These bacteria will fix on to the Saw tree rootlets and set up the irritation which is the cause of the disease which we see in the shape of nodules. These on becoming ripe, as we have seen before, burst and let loose bacteria which the higher plants—in our case Tea—have the property of living on.

Dripping of Water from Trees.

SIR,

In the 'Indian Forester' for November 1895, page 420, there is an article on this subject.

II.—In the 'Week's News' (published in the Pioneer Press, Allahabad) for the week ending 16th November 1895, under casual cuttings, is a more interesting article with *The Water Tree* for its heading. This runs as follows :—

"M. Ducharte recently made known to the French Academy 'of Science the results of an experiment made by M. Maxime 'Lecomte in Congo upon a tree of the genus Musenga. Upon 'making incisions in the trunk of it and placing a pail at the foot 'of the tree, more than ten quarts of pure water collected in 'thirteen hours. The gorillas, it seems, are in the habit of slaking 'their thirst at these hidden fountains, and regulate the flow of

'liquid at will by pulling off different sized branches. Many years 'ago Dr. Wallich found in the province of Martaban, Africa, a 'a plant belonging to the same natural order, whose soft and porous 'wood discharged, when wounded, a very large quantity of a pure 'and tasteless fluid, which was quite wholesome, and was used as 'a beverage by the natives. This plant was named by Dr. 'Wallich the water vine, and has been placed in the genus 'Phytocrene, which signifies plant fountain." These plants form 'a remarkable exception to the usual character of the order, which 'enbraces species that produce a miky juice—such, for example, 'as the celebrated cow tree, or Palo de Vaca, of South America, 'which yields a copious supply of a rich and wholesome milk, as 'good as that of the cow, and used for the same purpose."

III.—In the said paper for the week ending 23rd November 1895, page 3, under *News in a Nutshell* is found the following :—

"The cow-tree, the sap of which closely ressembles milk, 'is a native of South and Central America. It is a species of 'evergreen and grows only in mountain regions. A hole bored 'into the wood or even a wound made in the bark of this remark-'able tree, is almost immediately filled with a lacteal fluid, which 'continues to flow until it coagulates at the mouth of the 'wound, soon healing the abrasion. This curious fluid is 'both palatable and nourishing."

IV.—Also from the creeper *Vitis latifolia* and perhaps other creepers, the Dehra Dun Forest School students often secures enough water to slake his thrist while working in the forest on practical teaching.

K. S. KRISTNAMA ACHARI.

A Forest Departmental Blazer.

DEAR SIR,

I send you some patterns, one of which possibly might do for a blazer. I am afraid, however, the question of having one for the whole of India has fallen through. I obtained some cloth from Burma not long ago for the purpose of adopting the blazer used there, but it was not liked by anyone and I eventually returned it.

If one blazer cannot be found to suit the wishes of everybody, why should not each Presidency have its colours ?

G. E. M.

NOTE.—The patterns received, which we regret we are unable to reproduce, are combinations each of dark and light green in stripes with occasional bands of light and dark brown, Blazers are, we believe, rather 'going out' now, as they have become so very generally vulgarized at home. Why should we not however adopt the colours which were used by some of the 'promotors' of Nancy men and which were, we understand, a simple dark green coat with a narrow white ribbon edging. It is neat and simple and is not the sort of thing which 'Arry would care to sport on the Margate sands.

HON. ED.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Note on Casuarina Planting.

By E. P. Popert, Esq., Conservator of Forests, Central Circle, Madras.

The varying and in some districts apparently excessive cost of casuarina plantations induced me to call for information from all districts in the circle in which casuarina is planted. District Forest-officers were asked in December 1893 to furnish the following information :—

(1) Average yield per acre, age at which felled and net revenue.

(2) Usual date of formation of nurseries with cost of (*a*) preparation, (*b*) watering, (*c*) permanent and temporary establishment per mensem, and (*d*) rate of wages paid for coolies with number of months employed.

(This information to be reduced to show the cost per acre of plantation.)

(3) Cost per acre of planting out, including (*a*) sinking and cleaning wells with number per acre, (*b*) digging pits for seedlings, (*c*) planting out, (*d*) watering, (*e*) re-planting casualties and (*f*) establishment, permanent or temporary.

(4) With regard to the charges for 3 (*d*) watering, (i) number of years usually watered and number of months in each year, (ii) cost during first year, second year, and (iii) number of seedlings a cooly is supposed to water per diem and the number of times watered each month.

2. The information has been furnished more or less. It has naturally taken some time to tabulate, as old returns had to be examined. That from Chingleput is particularly incomplete and unreliable. No attempt had been made in Trichinopoly to record the yield per acre. It is evident, and to be regretted, that in these districts in the old days, sufficient interest was not taken to check the work. It is not to be wondered at if the cost has been high. No branch of forest cultural operations lends itself more readily to cheating by subordinates.

3. The following is a summary of the information received, omitting Chingleput, which is not worth tabulating :—

(*a*) *Average age of felling.*—The average age of felling is ten years.

(*b*) *Outturn per acre.*—The average outturn ranges between 50 tons in Nellore, and 28 in North Arcot. The plantations in North Arcot are situated some distance from the coast, have less moisture and are altogether less favourably placed. It is intelligible that the growth is slower.

(*c*) *Cost of Nurseries.*—The seed is sown in nurseries in Nellore, North and South Arcot about February, in Tanjore not until June and in Trichinopoly at various times. There is no reason for delaying the sowing in Tanjore until June, and in future the practice in other districts should be followed. Trichinopoly is somewhat different; as the padugais are liable to flooding during the rains, the formation of the nurseries has to be deferred. The cost of nurseries differs very materially and cannot be accounted for by difference in the rate of wages paid to coolies. In Nellore the cost of nursery for one acre of plantation amounted to 9 annas 1 pie. In Tanjore it would appear the cost has been Rs. 5 per acre. In South Arcot it is shown as Rs. 2-5-7. It is impossible to gather from the North Arcot statement the cost reduced to an acre of plantation, but the cost per acre of nursery is given as Rs. 140. The area this nursery is supposed to provide with plants is not given.

(*d*) *Cost per acre of planting*—(i) *The cost of pitting* in Nellore and Tanjore amounted to 6 annas per 1,000 plants, in South Arcot to 6 annas per acre and in Trichinopoly is put down at Re. 1-1-6 per acre. There is ample scope for reduction in the last-named district. (ii) *the cost of planting* out the seedings in Nellore and Tanjore was practically the same, 4 annas and 5 pies per acre. In South Arcot, inclusive of watering while planting, it amounted to one rupee per acre; the higher rate in this district compared with Nellore in due to the larger number of plants put out—1,210 per acre instead of 540. In Trichinopoly, however, the cost of planting out 1,200 seedlings is shown as Rs. 3-6-0 per acre. In future I think 9′ × 9′ may be adopted as a rule for the distance when planting, and the cost, I consider, should not exceed 6 annas.

(*e*) *Cost of watering* (i) *Wells.*—The cost of sinking wells varied from 4 annas per well in Nellore and Trichinopoly to 14 annas in Tanjore. This naturally depends upon the soil and the depth of the water level below the surface. The number of wells per acre ranged from three-fourths of a well per acre in Nellore to two in Tanjore. It is not advisable to stint the number of wells, their cost is trifling and it must be borne in mind the nearer the wells the greater the number of plants a cooly can water per diem. (ii) *Number of plants watered per diem by one cooly.*—In Nellore a cooly watered 1,000 plants per diem, giving each plant half of a large chatty. In Tanjore the same number

of plants was watered twice a day, each plant receving two-thirds of a chatty. In South Arcot the number varied from 600 to 800 plants. In North Arcot a female cooly watered 150 to 200 plants, giving each plant one whole chatty, and in Trichinopoly only 135 plants. There is no doubt the figures in the last district do not represent a fair day's work, and there is no reason for the average being below that of other districts. With three wells to the acre a male cooly should water at least 600 plants per diem. (iii) *Length of time watered.*—In Nellore it was the practice to water the seedlings for four years. In the first year the plants were watered daily from time of putting out (September and October) until May after which the number of coolies employed depended upon the intensity of the south-west monsoon and the site of the plantation ; on high sand banks daily watering was undertaken until the North-east monsoon. The second year watering was conducted from February to May and in August and September. The third year watering was confined to the months March to May and August and September, the same during the fourth year. The cost amounted to Rs. 41-14-4 per acre. In North Arcot it was the custom to water for three years throughout. In South Arcot, as a rule, plants were watered for six months in the first year, four or five in the second and occasionally during unfavourable seasons for some time in the third year. The cost for two years' watering amounted to Rs. 26. In Tanjore, plants have been watered for four months in the first year, eight in the second, six months in the third and two months in the fourth, and the cost has been Rs. 58 per acre. In Trichinopoly, watering was supposed to be carried on for eight months in the first year, six months in the second and three months in the third. The plants were only watered from four to six times per mensem, yet the cost of watering amounted to Rs. 96-2-6 per acre. It is certain that the watering charges in some of the districts were excessive and no reason can be assigned for the excess. I feel convinced that under ordinary circumstances, except in North Arcot, it is seldom necessary to water regularly for more than two years, though it may be found advisable to water parts of plantations during the third year. Even in North Arcot it is decidedly unnecessary to water regularly for the whole three years.

(f) Establishments.—In some districts the permanent establishment undertook the supervision of plantations, in others, temporary overseers were entertained. These charges cannot well be compared as they depend upon the strength and distribution of the permanent establishment.

(g) Total cost per acre until the plantations are virtually left to themselves, exclusive of supervision charges.—Nellore Rs. 42-14-0, North Arcot Rs. 45, South Arcot Rs. 32-6-0, Tanjore Rs.68, Trichinopoly Rs. 108-11-6.

4. Since submission of these returns, in every district it has been found possible to reduce the cost of these plantations. The following appears to me an extreme estimate of the cost per acre of a plantation on sandy soil on which the seedlings are put out 9′×9′ or 540 plants per acre :—

	Rs.	A.	P.
Nursery charges	0	9	0
Pitting	0	6	0
Planting out	0	6	0
Wells	2	0	0

Watering.

First year—

Two months daily watering 600 plants per diem at two annas per cooly $=\frac{540\times2\times2\times30}{600}=$

	Rs.	A.	P.
108 annas	6	12	0
Three months watering alternate days $=\frac{540}{600}\times\frac{30}{2}\times\frac{3}{1}\times\frac{2}{1}=81$ annas	5	1	0
Three months watering every third day $=\frac{540}{600}\times\frac{30}{3}\times\frac{3}{1}\times\frac{2}{1}=54$ annas	3	6	0
	15	3	0

Second year—

Six months watering every third day $=\frac{540}{600}\times\frac{30}{3}\times\frac{6}{1}\times\frac{2}{1}=108$ annas	6	12	0

Third year—

Four months watering every third day $=\frac{540}{600}\times\frac{30}{3}\times\frac{4}{1}\times\frac{2}{1}=72$ annas	4	8	0
	29	12	0
Add 10 per cent. for contingencies, or say ...	3	4	0
	33	0	0

5. From previous experience it should be safe to estimate that a plantation, except in North Arcot, will yield after ten years 40 tons per acre. The revenue after deducting felling and removal charges will certainly amount to Rs. 3 per ton = Rs. 120

Deduct—

Cost of planting	Rs. 33	
Interest at 5 per cent. for ten years, say ...	„ 16	
Establishment charges, say 10 per cent. for ten years	„ 33	
		— 82
Total net revenue ...	R.	38

Or Rs. 3-4/5 per acre per annum.

In districts like North Arcot, the estimated outturn will probably not be realized; on the other hand, however, it is certain the revenue will exceed Rs. 3 per ton and the net revenue should not fall below my estimate.

The Teak trade of Chiengmai in Siam for 1894.

The value of the teak exported exceeds that of all other exports from this district. The arrivals at Chainat in the year 1894 were about 71,500 logs. This, as compared with 69,500 logs in 1893, shows a slight increase of about 2,000 logs, and very nearly reaches the figures of 1892, as may be seen from the following table :—

Year.	Number of Logs.
1888	63,000
1889	60,000
1890	30,000
1891	12,000
1892	72,000
1893	69,500
1894	71,500

The floating season of 1894 was good in the Chiengmai Valley. There were several high rises and there was not the super-abundance of water of the year before, but in some streams the water rose little and the timber was not cleared out. In the Lakhon River the rise was a fair one. A good deal of the timber that reaches Chainat or Bangkok in the course of one year is timber that has floated to the main rivers during the year before, but has not succeeded in reaching the rafting stations.

The returns of exports to Lower Burma have not yet been received and as it is judged best not to delay any longer the transmission of this report they are not included in it. The season on the Salween is, however, reported to have been also good.

The teak forests on the Salween side have been worked longer than those in the Menam Valley, and far more actively, owing to the higher price of timber in Moulmein and the keener competition. The result is that those forests have been almost depleted of timber, such as there is left within Siamese territory being either small or far from the main streams ; this is clearly shown by the increasing proportion of undersized timber that now goes down to Moulmein. The royalty is also double that on the eastern side. Under these conditions it is difficult to understand how those forests can be worked profitably unless the prices in Moulmein rule high.

The complaints of the foresters here on the small margin left for profit have continued during the year. Many good forests have been overworked, and the yield is now naturally smaller than in previous years ; and, apart from this, the terms sought to be imposed by the Siamese Commissioner on new leases of forests were decidedly onerous. The result has been that foresters have held back in anticipation of more favourable terms. The whole subject of the form of lease has thereupon been discussed by the Siamese and British authorities, and a satisfactory settlement was expected at the end of the year. A table of the forest leases granted to British subjects and registered at the vice-consulate since 1884 is appended :—

Year.	Number of Leases.					
	For 2 Years.	For 3 Years.	For 6 Years.	For 9 Years.	For 10 Years.	Total.
1884	...	...	2	...	...	2
1885	...	4	16	...	...	20
1886	...	1	2	...	1	4
1887	...	...	4	..	...	4
1888	...	2	1	...	...	3
1889	...	2	...	...	...	2
1890	...	...	...	...	...	...
1891	...	3	...	1	..	4
1892	1	6	...	...	..	7
1893	...	3	.	...	...	3
1894	...	...	...	...	...	...
Total ...	1	21	25	1	1	49

The lists shows that no leases were registered in H. B. M.'s Vice-Consulate during 1894, although the terms of a number of leases had expired. The foresters mostly confined themselves to working out timber felled within the terms of their leases. The leases shown in the above list comprise the greater portion of the forests in the provinces of Chiengmai and Lakhon. The remainder are worked by Siamese subjects almost entirely with British capital, so that the teak forest work and export business may be said

to be entirely in British hands, the bulk being controlled by two British firms.

The forests in the small province of Phre are worked somewhat irregularly, while those of Nan are still unworked, with the exception of those in the upper waters of the Me Yom.

The price of teak here and in Lakhon is 2½ to 3 pickats, or say 20 to 24 Rs. for an ordinary sized log 32 feet in length and 14 inches in breadth and depth, with 43 feet cubical contents. The local demand is small.

The complaints of timber stealing in the lower waters of the Menam have continued, but the thieves lacked the exceptional opportunities given them by the extraordinarily high waters of last year. It is hoped that measures now in contemplation will check the crime, at least in the cases where British subjects are the offenders.

Elephant stealing in the provinces bordering on the British Shan States remains unchecked; the offenders being mostly Shans, who escape beyond the boundary into remote districts, where it is difficult to trace them. Some arrangements are much needed and have been proposed to mitigate the evil. It is caused, in the first place by the absence of proper police control along the frontier on this side. It is satisfactory to note that no complaints are made of elephants being carried off into the Kârenni country as was common before the annexation of Karenni into British territory.

Disease carried off a large number of elephants at the beginning of the year, leaving a number of foresters on the verge of bankruptcy, but the heavy rains put a stop to it. The foresters do not understand the disease and therefore cannot guard against it. Being very infectious and sudden in its effects, it is probably a form of plague. In Lakhon the disease was not nearly so bad as in Chiengmai province. A forester's wealth and substance is in his elephants, and losses of this kind are ruinous but unavoidable.

Timber, other than teak, is plentiful, but is not worked except for local use. Some, like rosewood, is too heavy to float, while for other kinds there is yet no demand for exportation. A permit was, however, granted during the year for the working of 12 kinds of timber other than teak, and it is to be hoped that this will induce other enterprising foresters to try the exportation of various kinds of timber that may be valuable; and so, perhaps, open up a new field of enterprise. This is of peculiar importance in view of the rapid exhaustion of the teak supply in these States, in the absence of conservancy regulations.

The question of coolie hire is a serious addition to the already pressing embarrassments of foresters. The best coolie labour is that of the Khamus and other hill men, who come from the country east of the Mekong for short periods of usually 2 or 3 years. Within recent years the number of these most useful workmen has

been gradually decreasing, and this year very few have come westward. This is attributed to the French occupation of the Khamu country, and consequent enrolling of the hillmen for road-making and other public works. This reason, however, does not explain the decrease in previous years; and there can be little doubt that it is partly due to the difficulty experienced by many of these men in obtaining their just wages from unscrupulous or bankrupt foresters. Meanwhile, wages of such Khamus as are available have risen considerably. Formerly Khamus could be hired for 40 to 60 rs. a year and their food; now they cannot be had under 70 to 90 rs. a year. The foresters will before long have to content themselves with native labour, that is of Laos and Shans, which would be not more expensive but far inferior.

Joined to this labour difficulty is the growing scarcity of timber near the main rivers; so that where an elephant formerly could work out 60 to 70 logs a year, it can now only work out half that quantity. Foresters, therefore, now find they have to work under the disadvantage of an increase in the cost of coolie wages, higher fees, higher cost of provisions, and greater cost of working out timber. To compensate for this they can now obtain advances at 12 per cent. per annum, where they formerly had to pay from 24 to 60 per cent. The risk primarily falls on the exporters who advance the capital to the foresters; and the profits of the exporters are dependent on the London rates for teak. When these are low it would seem that the export of teak must be carried on at a loss. The foresters themselves reckon their net profits at 50 or 60 rs. a year for each elephant worked by them.

Appointment of a Conservator of Forests in Siam.

We are glad to be able to say, with reference to the last Article, that Mr. H. Slade, Deputy Conservator of Forests in Burma, has been deputed to Siam for the purpose of organizing a Forest Department in that country.

IV.—REVIEWS.

Schlich's Manual of Forestry.

VOL. IV. FOREST PROTECTION, BY W. R. FISHER, B. A.

"Forest Protection' is a new term to us, and we believe that in French also there are few, if any, works with such a title. It may be questioned indeed whether it is really justifiable, when we have no special works on Forest Utilization, Forest Engineering, Forest Zoology, and Forest Botany, and have only recently possessed

special works on Sylviculture and Forest Law, for a work to be published which pre-supposes a good knowledge of the elements of all these. We are unaware if at Coopers Hill, Forest Protection is taught as a special course or whether, as at Lehra Dun, it is treated under the heads of the more definite subjects to which its various chapters belong. However that may be, there can be no doubt but that Mr. Fisher has produced a very excellent work, and one that will be of very great value not only to the students of his own class at Coopers Hill, but also to all English and Indian Foresters, and to many of the landowners who grow forests for one purpose or another, and take an interest in the measures which should be adopted for their protection in one way or another. As is stated on the title page, the work is an adaptation from the German, from the work of Dr. Richard Hess, Professor of Forestry at Giessen entitled 'Der Forstschutz' and we are bound to say that we like it much better than the 'Waldschutz' of Dr. Kaushinger and Fürst which was translated by Dr. John Nisbet and published in 1893. Comparisons, they say, are odious, and we do not intend to make any between these two works of German authors, adopted and translated by Indian Forest Officers, except so far as to remark that one point of value about Mr. Fisher's work lies in the numerous excellent wood-cuts in the text, so much easier to consult than special plates at the end, as is the arrangement in Dr. Nisbet's book.

The work before us is divided into six parts, treating of protection of forest against (1) man, (2) animals, (3) plants, (4) atmospheric influences, (5) non-atmospheric natural phenomena and (6) certain diseases. It is prefaced by an 'Introduction which defines that "Forest Protection has for its object the 'security of forests against unfavourable external influences as far 'as lies within the power of their owners" and shews how protection may be 'preventive' or 'remedial' and how the subject is connected with the other branches of Forestry and the sciences and subjects connected with it.

Under 'Protection against man' we are first given a clear and useful account of Demarcation, in which we seem to see traces of Mr. Fisher's old Indian experience, for the system advocated is very much what has been adopted in this country. There is one point, however, which Mr. Fisher should, we think, have made clearer, and that is the procedure, where, as so often happens in India, the Government has to demarcate forest land adjoining the states of jealous owners who do not participate in the work and its expense. In such cases the boundary ditches and rides and the marks themselves must be entirely on the side of the forest and such a plan as that of figure 2 at page 8, where the mark is partly on one side partly on another, would hardly do.

Then follows an account of protection against irregularities in utilization, such as over-felling, careless conversion, the removal of

leaves and humus, and above all, badly regulated grazing. An interesting figure is given of the damage that may be done by climbing irons used in the collection of seed, or for the lopping of branches, and it is shown how careless transport may damage the trees of the forest. Under grazing it is interesting to note Hundeshagen's table of the relative damage done by European grazing animals, which, assuming the horse to be represented by 100, gives 75 for young cattle, 50 for old cattle, 25 for goats, and 29 for sheep. As a goat, however, weighs about one-fourteenth as much as a horse, it does therefore presumably 3½ times as much harm.

We are glad to see that Dr. Hess and Mr. Fisher agree with us in the opinion we have always held as to the effect of constant grazing on unburnt grass areas being the gradual disappearance of the coarsest kinds of grass and the substitution of finer and more and more nutritious species. We have noticed this ourselves in many places in India and nowhere more clearly than on the Nilgiri Hills, and in some places in the North-Western Provinces, which could be pointed out.

The Chapter on 'Protection against Forest offences' has had the advantage of the unrivalled experience of Mr. B. H. Baden-Powell, C.I.E., who has himself written the pages on forest property and forest rights so as to make them agree with English Law. This is, in itself, a sufficient guarantee for their excellence.

On the subject of Part II 'Protection against animals,' we are glad to reproduce a short Note which has been written for us by a competent Indian authority, who says:—

Not the least interesting and useful portion of this work is that which deals with the animal foes of the forest. These, so far as European species are concerned, are very fully dealt with. We should like to point out, however, that though the first chapter of this section is rightly enough headed 'Protection against Animals' in the general sense, the same heading when confined to the tops of the pages dealing with the injuries inflicted by various *Mammalia* only, is out of place. The popular use of the general term "Animals" in the special sense of a Mammal or Beast, should not be countenenced in such a work. In this Chapter a slight error occurs, where it is stated that holes made by the woodpecker may be a source of harm if subsequently occupied by ring-doves. It is the stock-dove, not the ring-dove or wood-pigeon, which nests in holes, and this is fully recognized in the same connection later on (p. 131). For extra-European animals the reader is referred Mr. E. C. Cotes' work on Indian Forest Zoology.

Full details as to the damage inflicted by the various species of European deer follow, with the methods of obviating this, which are well worth the attention of foresters here. It is pointed out that the existence of a reasonable quantity of game is quite compatible with the interests of the forest. Pigs are better than deer, as they may be beneficial as well as injurious, by breaking

up the soil and destroying vermin. Reference is made to the *Indian Forester*, Vol. XI. p. 530 *re* a plan for catching them. Hares, rabbits, and other rodents not regarded as game, are dealt with, and the ravages of and remedies for various species of mice fully dealt with. Protection of their carnivorous enemies, both beasts and birds, is recommended, when these are not too destructive to game or useful birds. Birds, generally speaking, are to be considered useful, not many being selected as offenders to sylviculture. We must say we are somewhat astonished to see the Robin (*Erithacus rubecula*) set down, together with the Mealy Redpole and Bullfinch as a seed and bud-destroyer; whatever damage it may do in this way must be unworthy of notice, considering its solitary and generally insectivorous habits. We would also caution the Indian forester against dealing so severely with the Indian Jays as our author recommends in the case of the European species; the greater abundance of large insects in Indian forests gives these birds a greater chance of doing service, to set off their ill work in devouring seeds and useful birds. The case for and against woodpeckers is set forth in this chapter, and judgment given in the birds' favour. It is pointed out that all useful birds tend to keep down insects in normal years, though unable to avert a plague; such visitations are put an end to by fungoid diseases and parasites. In the next chapter, which contains an admirable general account of Forest insects, embodying concise and clear sections on classification, distribution, and the like, we find the subject of birds and other insect-enemies again taken up and directions given as to the provision of food and nesting places for the former, under the head of Preventive Rules. The following chapter deals with those enemies of insects which belong to their own class and is a particularly instructive and interesting one, all the important families being characterized and their benefits particularized. The injurious insects follow, taking up a larger space than all the preceding animals put together, and are treated very completely; family and specific descriptions are given, the relations of each species to the Forest discussed, and Protective Rules given, under clear headings; in fact, this convenient division of the subject-matter is one of the most striking features of the book. To the Indian forester the more general portions of this part of the work will naturally be of most value, and he should derive much instruction from the accounts of the many methods of protection given, while the family descriptions given will often be of service even when dealing with Indian insects—a remark which applies equally to the chapter on insect benefactors. A most useful list closes this part of the book, including all the injurious insects dealt with therein, arranged according to the species of tree attacked and the different organs of it which suffer, with other details indicated by abbreviations. This chapter concludes with an earnest injunction to the forester to study

forest insects; their life history and relations to the forest must be known, and that not from books; for "inattention to those 'little creatures has already in many cases been severely punished 'by the sacrifice of the labour of years." Once an insect attack 'has attained large dimensions man's efforts against it are almost 'powerless." If this be true in Europe how much more is it the 'case with India! It will be a happy day for the Indian Forester when a work similar to this can be published dealing with this country.

The whole of this part has been gone over and revised by Mr. W. F. H. Blandford, lecturer on Entomology at Coopers Hill It ends up with the valuable remark that "the most effective 'means for combating insect attacks consist in careful and cleanly 'forest management, and in repressing an attack at its very com-'mencement."

Part III, 'Protection against Plants' has had the advantage of correction by Prof. Marshall Ward, F. R. S., now Professor of Botany at Cambridge University, and is a most interesting account of a subject which has only in recent years and chiefly through Prof. R. Hartig's researches, been developed as one of the most important ones which a Forest Officer has to deal with. To any one who knows where to notice them, evidences of damage by plants may be seen almost everywhere, not only in Europe but in India. If we are not mistaken, *Agaricus melleus* may be seen attacking oaks and conifers in the North-West Himalaya just as severely as it does the pines and spruce in Germany or the oaks of Capetown. Species of *Polyporus* may be seen doing very great damage in the plantations of Sissú at Changa-Manga and of Casuarina in Nellore. *Ælcidia* of various kinds are common on he Himalayan trees of many species and especially on the blue pine, spruce and fir; black *Meleola* covers the leaves of the sál trees in the Dún and in Oudh. Of phanerogamous parasites we have only too many, for in addition to the mistletoe of Europe, which is so common in places in the Himalaya, especially on apricot trees, we have numerous almost gigantic species of Loranthus devastating our forests and plantations as may be splendidly seen in the havoc it has wrought among Australian Acacias in the Nilgiri plantations of Bandy Shola. We have gone over Mr. Fisher's work with much interest, and in many ways prefer it to the more elaborate and detailed accounts given in the recently published edition of Hartig by Dr. Somerville. We commend the subject to Indian foresters as an almost new field, and look forward to the time when we shall have a good Indian book about it by a Forest Officer who has traced the diseases through all their stages and can suggest measures for their prevention. We would draw our readers' attention to Dr. J. Nisbet's article in our number for April, 1895 (Vol. XXI), as well as to the work done by the late Dr. Barclay, and published chiefly in the proceedings of the Asiatic Society of Bengal.

It is naturally the diseases caused by fungi, that take up the greater part of Mr. Fisher's, Part III, but excellent accounts are also given of the damage done by the parasites like the mistletoe and dodder, by climbers and by forest weeds, which prevent reproduction, impoverish the soil or produce a sour humus which is bad for the growth of most forest trees.

Part IV, 'Protection against atmospheric influences' begins with our great enemy in Northern India, the *frost*. It shews what gradations there are among forest trees in the matter of susceptibility and what are the localities in which frost is most to be feared, and gives suggestions for prevention. Among other interesting matters touched upon, we may draw attention to the series of pictures shewing the way in which frost acts upon young seedlings, gradually lifting them out of the ground until their roots lose their hold and the plants fall over and die. After 'frost' comes *insolation*, the effects of which are often very marked on isolated trees in the dryer regions of South India, where we have more than once seen every tree in a planted topè damaged irretrievably by the effect of the sun on its exposed side. Then come *storms*, *violent rain*, *snow*, and *ice*, all of which we know to be important and dangerous sources of damage to forests. We note that it is considered that woods which have been properly thinned are generally less liable to damage than unthinned woods, as the snow can more easily reach the ground and the wind can more effectually aid in shaking it off the branches of the trees in the canopy.

In Part V, the influences treated as 'non-atmospheric phenomena' are swamps, floods, and torrents, avalanches, shifting sands, and, last but not least, forest fires. The question of drainage is well discussed and some good suggestions, which may be of use in the Himalaya, are given in regard to works of protection against avalanches. No account of shifting sands in Europe would be complete without reference to the great works undertaken in France on the shores of the Bay of Biscay which are described. We note that on the German coast sods and in Flanders straw, are used to cover the ground in places in danger and protect young growth; while in South Russia the *Ailanthus glandulosa* has been grown successfully on Sand-dunes. This tree Mr. Fisher suggests, is a very accommodating species and should be tried in places on the Indian coast where the fresh water is too far from the surface to allow of *Casuarina* being grown. Noticeably also is the hint that the Jerusalem artichoke which is most easy of propagation, can be successfully used to shelter the young tree-growth, on shifting sands. The chapter on fire-protection has clearly borrowed somewhat from Indian experience, and gives a careful general account of the best measures of prevention to be adopted.

In the final Part VI., the 'certain diseases' discussed are chiefly the following: red-rot, white-rot, stag-headedness, abnormal

needle-shedding and damage by smoke. The causes of these diseases are explained and measure of treatment suggested.

We have now run over briefly the chief subjects treated in this excellent Manual, which ought to be in the hands of all Indian forest officers as a guide to and help in observation. Many a forest officer has, we dare say, however well-trained he may have been, asked himself what are the points which it is most important for him to observe as he goes through his daily routine in the huge forests he has to administer in India: as a help in answering the question, this work of Mr. Fisher's, and that previously published by Dr. Nisbet should be of great service.

It has, incorrectly, we believe, been said that 'there is no rose with a thorn' and it may be suggested that an appreciation of this excellent work may need some little thorn to show that we are not entirely partial. In the present case, the sting, like the scorpion's, must come at the tail, where lies the chief defect in the work and that is simply the absence of an Index. We know how often it happens that German and even French works suffer in value from the absence of an Index, but English books are usually free from the reproach and we hope that our friend Mr. Fisher, when he publishes his next edition, will remember our suggestion and give us a good Index to help us to utilize his abours to the best advantage.

Annual Forest Administration Report for Bengal, Coorg, and Berar for 1893-94.

The *Bengal* Report is written by Mr. A. E. Wild and is an interesting one; the Local Government has, however, complained of its length, though it seems to us that the length is more apparent than real, as there are 40 pages of print rather larger than that in use in some other Provinces.

The area of forest under the Department in Bengal amounts to

	sq. m.	
Reserves	5831	}
Protected	3059	} Total 12,924 square miles.
Unclassed	4034	}

We are sorry to see that the Sonthal forests have not yet been taken up; and glad to notice that 363 acres of the Paglajhora catchment basin near Kurseong have been taken charge of to be treated in an attempt at reclamation. This is a work which has long been urgently wanted and we shall be glad to hear next year what steps have been taken to stop the torrents. It will not be an easy matter even with some expenditure, but simple closing and fencing will doubtless effect a great deal by themselves

alone. Fire-Protection seems to have failed very seriously, especially in Singhbhum where 402,538 acres were burnt out of 468,322 whose protection was attempted. Very naturally, the Local Government have made some remarks on this and say :—

"The Lieutenant-Governor is surprised to learn that in 'Singhbhum no effectual attempt was made to check this enormous 'waste. Even if his aid was not invoked, the Deputy Commissioner should have brought offenders to justice if they could be 'identified, or failing that, he should have adopted other measures 'for the control of the population. His Honour observes that 'the Conservator has taken steps to keep himself informed of the 'occurrence of such cases and in view of the gravity of the circumstances disclosed, His Honour desires that until further 'orders a special report may be submitted to Government concerning every serious fire in a State Forest, as it occurs, showing 'how it originated and what measures were taken to punish the 'offenders. His Honour also approves of the Conservator's order 'that in respect of offences by fire, compensation should not be 'accepted under section 67 of the Forest Act."

The Government of India have approved of the orders given and especially of the one prohibiting the compounding of offences of incendiarism, which prohibition we fully agree is a proper policy. In an Appendix to the Report is given a note by Mr. H. H. Haines, Deputy Conservator, which we reproduce.

"Savannahs of greater or less extent occur in all the 'Jalpaiguri forests, and are of two kinds—

"1. Those on high land, which usually burn early in the 'season.

"2. Those in low land, which, will often not burn until the 'the hot weather.

"They first appear to have their origin in the thinning out of 'the tree growth by repeated fires, and they frequently pass 'gradually, on the one hand, into stocked forest without any sharp 'line of separation, and on the other hand into the low-lying grass 'land.

"It has been found that the firing of the first kind early in 'the season, and especially not long before the precipitation of 'dew, does comparatively little harm to the tree growth. The fall 'of the leaves of the trees of course takes place but these leaves 'have already nearly completed their work, and would soon fall 'naturally, and the previous annual shoots are seldom entirely 'burnt back. Seedling sál in the thicker grass is usually burnt 'back to the root, but very strong shoots which have sprung from 'root stocks, whose shoots have been burnt for several previous 'years, will survive where the grass thins off into the stocked 'forest. Thus, although the advance cannot be as quick as in the 'cases where fires can be excluded altogether, I am of opinion that 'the forest will very gradually advance upon the savannah.

'Experience has shown that fires cannot be excluded altogether for several years successively, as incendiary fires cannot be entirely stopped. Incendiary fires usually take place from March to May and at any time of the day. The grass at this time is very dry, The new shoots of the sál (which have now sprouted) with the new crop of leaves is entirely destroyed, and the growth thus almost stopped for the year, while such fires will often kill outright sál saplings of several years's growth. As incendiary fires, from their ready ignition, most commonly arise in savannahs, the advantage of departmental firing is obvious.

'Where a savannah of the second type abuts on a sál forest it cannot usually be fired without the adjoining forest also becoming burnt. This forest is thus thinned out gradually at the edges, and a repetition of the fire annually will gradually give rise to a savannah of the first type on the high land. This probably explains the origin of the highland savannahs. To fire low land savannahs departmentally, therefore, requires first that a *pharé* should be cut around them, and that they should be fired from their edges all around. The advantage of this departmental firing prevents the extension of the savannah, but such blanks can never be themselves filled up, another advantage being that wholesale forest fires are made more difficult to produce. The results of departmental firing of savannahs are thus satisfactory and such firing is, I believe, at present the only practicable way of reducing the terrible damage hitherto done to these forests by fire."

Mr. Haines perhaps does not know that the departmental burning of Savannahs ('tappars' in the N.-W. P.) is a common practice and a most important one, as enormously reducing the danger of fire in the more valuable forest adjoining. Also that it was regularly in force in Bengal from about 1880 for some years on the strong recommendations made by Sir D. Brandis. Such a forest as Muraghat, surrounded almost entirely by long grass tracts, and with pieces of savannah running in here and there ought to be very easy of protection in this way. In our opinion, the 'lowland' savannahs never will produce sál or indeed any other trees of value and ought to be under cultivation—the 'high-land' ones are probably mostly areas where sál will only grow with difficulty and of poor physique.

'Grazing' in Bengal is a subject, to judge by the returns, which need give but little anxiety to the forest officers, for after all, only 867 buffaloes, 1,094 cows and 403 goats grazed in the Northern Bengal 5 Divisions with a revenue of Rs. 7,138 or over Rs. 3 per head. The only District in which the grazing seems to be heavy is Puri where 9,900 animals grazed at full and 1,60,000 at privileged rates, the revenue being Rs. 4,661.

Under 'Natural Reproduction,' the most noticeable thing is the seeding and dying off of the bamboo in the Darjeeling Hills

"enabling the sál to gain ground in a successful manner." On this a Bengal forest officer of experience writes to us. "It is a 'pity that departmental operations are not undertaken to put the 'struggling young growth of sál in a favourable condition for 'developing before the bamboos reach their full size again. If 'set free from creepers and inferior growth of all sorts now, the 'proportion of sál would be fairly doubled, I think." In Burma, when a bamboo seeding year occurs, every means is at once taken to reap full advantage of it for the benefit of teak and we hope that something of the kind will also be undertaken in Darjeeling. The bamboo referred to is *Dendrocalamus Hamiltonii*.

We notice that the Japanese *Cryptomeria japonica* which is so successfully cultivated in the Daljeeling Hills, has begun to produce natural seedlings. The average girths of the *Cryptomeria* trees at Dhobijhora is given as 39 inches.

On the Extraction of forest produce, there is not much to notice, save that the working of the forests of Orissa for the East Coast Railway has been prevented by their great unhealthiness. It is also noticeable that the lease of 'Sabai' ('Bhabar'—*Ischæmum angustifolium*) grass from the Singhbhúm forests was given for Rs. 3,000 instead of for Rs. 1,750 as last year. Mr. Wild gives the requirements of three out of the five Calcutta Paper Mills as 3,10,000 mds. and seems grieved that considering that the grass is valued at Rs. 1-7-0 per maund, the Government does not get a larger share in the profits. Perhaps, however, the cost of cutting over wide areas and of the freight of such a bulky article comes to more than the Rs. 1-2 which he estimates. If not, it is surprising that the leases do not attract greater competition.

The 'Financial results' of the year were —

Forest year	Revenue ...	...	7,73,096
	Expenditure ...	...	3,98,389
	Surplus	...	3,74,707
Financial year	Revenue ...	...	8,01,611
	Expenditure ...	...	4,04,043
	Surplus	...	3,97,568

The *Coorg* Report has not much of great interest, though there are a few things which deserve notice. In our last issue (December 1895) we discussed the question of *Lantana* which Mr. Prevost calls the 'Forester's friend.'

Noticeable is the account of the systems under which Sandal has been and to is tobe exploited. On this the Deputy Conservator says :—

"During the year, 185 tons of sandal-wood were collected at 'an average cost of Rs 35-7-11 per ton against Rs. 30-5-3

'per ton in the previous year. The average cost of collection for 'the past 10 years was Rs. 31 per ton. The selling price per 'ton was Rs. 417-10-11 against Rs. 448-8-0 in 1892-93. I 'trust by the new system of departmental collection lately 'introduced, to reduce this expenditure to Rs. 28 per ton, and at the 'same time bring in a superior class of sandal. The old system 'of collecting sandal was to uproot only such trees as were 'absolutely dead; over-mature or half-dead trees were left to still 'further decay, and the subordinates entrusted with the work, did 'not judge a tree by the state of its trunk, but were entirely 'guided by the appearance of the leaves, and if they showed the 'least signs of vitality, the tree was considered green, and was not 'marked for uprooting. This method of selection was not sound; 'once a sandal has matured, decay rapidly ensues, and at all 'periods of its existence it is most susceptible to any injury to its 'bark and roots, and it is rare to find any tree over fifteen years 'of age, entirely sound, and free from rot, &c. Instead of obtain-'ing the full possibility from matured trees, these injured and half 'decayed trees were left to struggle on until they were entirely 'dead, and then when brought to koti were found to possess no 'billets, were hollow, and cracked, difficult to work up, and the 'quantity of heartwood had materially diminished."

'Under the present system, a trustworthy Ranger is allowed 'to mark for removal those trees which are entirely dead, but the 'marking of over-mature and hollow trees which though not really 'dead ought for sylvicultural reasons to be removed, is done solely 'by the Deputy Conservator. Certain tracts of country are 'systematically worked over, and at the same time sandal seed is 'freely scattered in all likely localities. By this method every green 'sandal tree in the country comes under personal supervision; 'all cases of illicit damage can be at once detected; villagers 'warned to protect the trees, and not to injure them when burning 'the lantana surrounding their fields, and the progress of natural 'seedlings, results of broad-cast sowings, dibbling in, and other 'works of utility generally observed and noted. The quantity and 'quality of sandal obtained from these over-mature, but not 'actually dead trees, is greatly superior to that formerly obtained 'from those entirely dead, and it is absolutely certain that under 'the present system a greater possibility per tree is realized. 'Great attention has also been paid to the thorough extraction of 'all roots, as they contain a very large proportion of essential oil, 'and command high prices at the annual sales."

The financial results for the forest year were :—

Revenue	Rs.	1,75,991
Expenditure	„	90,546
Surplus	„	85,045

In the *Berar* Report also there is little for us to specially notice. As with Coorg, the *Lantana* question has already received treatment in our pages.

The Financial results for the Forest year were :—

Revenue	Rs.	4,79,475
Expenditure	„	2,64,318
Surplus	„	2,15,157

Forest Administration in South Australia, 1894-95.

Our review of the South Australian Forest Report for 1893-94, appeared at page 239 of Vol. XX. (June 1895) and we pointed out then, as indeed we had done on previous occasions how unsatisfactory it was as a record of real Forest work. The Reserves cover 215,696 acres but of this apparently only 11,881 acres are under any sort of management. What happens in the rest is no more apparent from the Report of 1894-95, than it was from that of 1893-94. The Revenue was £3,709, the expenditure £7,342, or a deficit of £3,643, which is one-half of the expenditure. What advantage the Department has been to the Colony except for the plantations, of which there is so little information that we are quite in the dark, it is difficult for ousiders to understand. The natural forests are apparently let out on lease for the cutting of timber, for grazing and cultivation.

The chief good work done by the Department seems to be the distribution (gratis ?) of trees and vines, for no less than about 300,000 of each were distributed during the year.

Report on the Horticultural Garden, Lucknow, for 1894-95.

This Report is unfortunately scarcely more than a record of disaster. In the autumn of 1894, a high flood in the Gumti River submerged part of the garden and much damage was done in all departments of the garden's work. In the Arboricultural section, the nursery was submerged for a week, so that out of 19,000 plants on hand at the beginning, barely 3,500 were alive at the end of the year.

It is not improbable that the low site of the garden is responsible for the ill success of the edible date which seems to perish unaccountably in spite of all care. The introduction of the Persimmon trees has not been very successful so far, but we are glad to say that they have done better in Dehra Dun with the

advantage of being tended by that successful and enthusiastic fruit culturist, Mr. Angus Campbell. The list of trees cultivated in the Nursery is a large one, but it is a pity that only native names should be given : even to a Forest Officer 'Shahtooth,' 'Momseri,' 'Chilwal,' 'Macluria,' 'Kankohar' and 'Kanyei' are rather terrible.

The plantation of the beautiful *Eucalyptus citriodora*, the prettiest of the genus, to our mind, is apparently a great success ; we should have liked to hear more about it.

The garden has been trying to do good work in educating native and European gardeners, but its success has been rather poor, for the two Europeans were failures, and of the natives, three left and two were dismissed for misconduct. This is a great pity, for there seems to be a considerable demand for good trained men.

V—SHIKAR AND TRAVEL.

The Mongoose in the West Indies.

Some years ago the Cane Fields in the North of the Spanish Colony of Puerto Rico were so much ravaged by rats, that Planters had recourse to the Mongoose, or Munguz. Four pairs were introduced from Jamaica. They multiplied with great rapidity, and in a very short time rats had practically disappeared ; I myself have seen them by dozens drowned in the canals intersecting the Estate, driven apparently to take to the water to escape their relentless foes. Revisiting the Island after an interval of two years, I found the Mongoose established as an institution, infesting poultry yards, over-running houses, and often being made a domestic pet. The Canes were saved from one pest but at what cost the accompanying cutting from the "Field" of 13th July, describing the effect in Jamaica, will set forth. If any of your readers have the idea of introducing the animal to exterminate rats, the evidence of *V.* should make them reflect before they do so.—(F. N. in *Révue Agricole* of Mauritius).

The mongoose was introduced into the West Indies for the ostensible purpose of destroying the large grey white-bellied rat that played havoc with the growing canes on the sugar-growing plantations. That it fairly achieved the object for which it was imported cannot be gainsaid, but that it would ever become the universal pest that it is at the present day, and has been for the last ten years, was never anticipated. So long as it kept to the cane-growing plantations and ate the planters' poultry, eggs, and all young and available animal life within a reasonable distance, all went well; but with its rapid and prolific powers of reproduction and its vagabond and roaming disposition, it in very short time—a few years—was to be found in every part of the islands, from the sea shore to the tops of the loftiest range of mountains, the highest peak of which is 7,360 ft. above sea level.

I have had a long and intimate acquaintance with the mongoose, that is, since its first introduction nearly a quarter of a century ago. A few years ago attention was directed in a pamphlet on agricultural matters to the mongoose, its greatly increased numbers, its distribution and the devastation it was accomplishing, not only to young animal life alone, but to vegetation in the island of Jamaica. This pamphlet brought letters from all parts of the island, all of which complained most bitterly of the mongoose and the damage it was causing everywhere. The general wail had the desired effect, and a commission was appointed by the local government to inquire into and report upon the ubiquitous pest, *Herpestes ichneumon*. Very many gentlemen were called and gave evidence, and with one solitary exception—a cane cultivator and sugar boiler—their voices were raised against this new and introduced pest.

The mongoose, as I have said, was introduced to destroy the cane rat. Though it has not exterminatod these rats, it has lessened their numbers in the canefields, and saved the sugar-planters a lot of money. It was not introduced to destroy, but it has most effectually nearly exterminated, all the ground-laying and feeding birds, poultry, eggs of all kinds, on the ground and in trees, including those of the land turtle; it kills young pigs, lambs, and kids; eats fruits of all kinds, canes, ground provisions, fish, wild-fowl, snakes, lizards, crabs, etc. All young and tender life, animal and vegetable, is included in its daily menu.

It has been said that the mongoose does not climb, and that he is only a day forager. Neither assertion is correct, for the animal will climb into a tree that would try the agility and pluck of a young descendant of Ethiopia, and during the beautiful moonlight nights that one experiences in the tropics, the mongoose will take his walks abroad intent on destruction of some kind. When up a tree he will destroy eggs or young birds in the nest, or eat the fruit that may be ripe. He does not kill the domestic or dark-furred rat, and I am aware of an instance in which a mongoose

and two of these rats found a common home or lodging-place in the trunk of a fallen tree. This, however, must be regarded as an exceptional case.

In Jamaica, there was a beautiful and indigenous snake, a friend to the agriculturist, *Chilobotrus inornatus*, commonly called the yellow snake, and growing to a length of six or seven feet. It is gone; love or money cannot procure a specimen, although I have been trying for the last five or six years to obtain one for a friend. Another ally of the land cultivator, the ground-lizard (*Ameiva dorsalis*), is gone, or is very rarely seen now, though formerly there were hundreds.

When he has cleared off the animal life and the fruit in a district, the mongoose turns his attention to the ground provisions, and here again he shows the variety of his tastes and the power of his jaws. He will grovel away with his paws until he lays bare yams, cocoas (*Alocasia*,) sweet potatoes, cassava, bitter and sweet (the former, *Manihot utilissima*, poisonous in its raw and unprepared state), and other ground food bulbs. Of fruit, he has a partiality for the banana, the various ananas, the mango, and others, as well as for some of the tree vegetables, for instance, the delicious akee (*Cupania edulis*) and pear. The mongoose will likewise, when the irrigation canals are drawn off for cleaning, seize fish and make off with them.

Not the least harm it has done has been the destruction of insectivorous birds and lizards, and the consequent increase of another nuisance, the tick. This is a subject that the West Indian Government is bound to take up in the near future, and there is, or will be, found only one remedy, the introduction, propagation, and protection of insect-eating birds, and here I may mention that the West Indian mongoose would be most gratefully exchanged for the English sparrow.

The mongoose breeds about six to eight times a year, and I have never known of more than five young at each time; but upon this point opinions differ, one eminent local doctor of medicine (and a naturalist) stated before the Commission that the young numbered ten to eleven. The mongoose lives in the hollow of dead trees, dry walls, ond other such places. His activity is wonderful, and it is a treat to see him leap at and secure a young fowl; he very seldom misses the quarry, which, when secured, he proceeds to mutilate in the groin, first of all drinking the warm blood, then devouring the liver, &c. With all his activity and pluck, however, he is no match against a good terrier, and those who wish to rear a few chickens must and do keep one or two of these dogs. The mongoose is cunning and sagacious; in fact he is highly educated. I have seen one abstract an egg from a hen's nest, take it up with the forepaws, hug it to its heart,

and walk off on its hind legs. Here is an instance in proof of its intelligence and reasoning power. The narrative comes to me first hand from a gentleman holding the commisson of the peace and not given to romancing. My friend, who is the owner of one of the principal coastal wharves in Jamaica and his own wharfinger, told me that his premises are overrun with mongooses, against which he wages perpetual war. He had noticed for a considerable time, as he sat in his office, an old buck constantly travelling to and fro between a log wood heap and the large warehouses. His contant perambulations had worn a distinct tract on the sandy soil. Afraid to have recourse to his gun in such a place, he provided a new spring trap, upon the lever platform of which he tied, as well as he could, as egg, and when the employés had drawn off for the midday meal he excavated a hole on the track, placed therein the trap, which he covered over with loose sand, leaving only the egg exposed, and, after making all smooth, retired to his office to watch. Ere long out came the mongoose and commenced a series of manœuvres as comical as they were cunning. After reconnoitring by some half dozen circular evolutions, he gradually approached the egg, and with his forepaws commenced to scrtach the sand away about six or seven inches from the egg. A part of the trap soon became exposed, when a few runs round doubtless expressed his satisfaction at outwitting the wharfinger. The excavating and circular perambulations continued until the trap was undermined on the one side, when, losing its equilibrium, it fell into the miniature pit; the egg rolled off, and was immediately carried away by the intelligent but destructive animal.

The mongoose nevertheless is easily trapped, and it is a strange circumstance connected with its capture that very few females are taken or killed, perhaps one in twenty. This would lead to the conclusion that either the males are greatly in excess of the females or that the latter stay more at home to superintend domestic arrangements.

However interesting the mongoose may be from a natural history point of view, the fact remains that it has overrun every part of the West Indies, has done, and is doing, incalulable damage in every direction.

The question may be asked, "Is it not possible to exterminate it?" The answer is in the negative. On the plains and in cultivated districts it may be partially kept down; in the hills, in the rocky, inaccessible and uncultivated districts, never. Here it is, and here it is likely to remain.

V.

VI.—EXTRACTS, NOTES AND QUERIES

Spinifex Resin.

Last year Sir William Macleay was kind enough to give me "a sample of gum used by the blacks for cementing the heads of spears.* and prepared from Spinifex roots," which had been collected by Mr. Walter Froggatt in the Napier Range (locally called Barrier Range), 100 miles inland from Derby, North-west Australia.

I was dubious as to it being the product of a "Spinifex," never having heard of a grass yielding a resin, but Mr. Froggatt is emphatic that he is not mistaken, nor is so experienced a collector likely to be. The Spinifex is probably *Triodia irritans*, R.Br., but further information on the subject, giving the mode of preparation of the resin would be very acceptable. Mr. Froggatt states that it is obtained from the roots, and local Europeans and aboriginals all make similar statements as to its origin.

It is in a cake about 4 inches in diameter, and 1¼ inch in thickness. The smell is something like beeswax, but at the same time it has an exceedingly disagreeable and persistent odour which is not easily described. It reminds one of the smell of the fabric known as corduroy. It is of especial interest because it is of aboriginal preparation. Its colour is that of a dirty dark bronze-green, or almost of a slaty colour with a little green in it. To the naked eye it looks very like finely chopped hay or grass-seed cemented into a compact mass. It is exceedingly tough, a sharp blow with a hammer on a cold chisel being necessary to fracture it.

Petroleum spirit extracts 3·2 per cent. of a transparent, colourless fixed oil or fat, which possesses a little of the disagreeable odour of the original substance. The solvent extracts no resin. As the substance has been made up into cakes by the blacks, and is to that extent not an absolutely natural product, it may be that the fat, or a portion of it, has been introduced.

*"The heads of spears from Western Australia in my collection are coated with a hard gum, forming a ridge on one side, in which pieces of glass are impacted." Brough Smith's *Aborigines of Victoria*, &c., i., 336. Mr. Froggatt informs me the Spinifex resin is put to such a purpose in the locality from which he obtained it.

The substance was then digested in alcohol, which extracts a transparent, hard, golden-yellow resin possessing some odour, and which appears to be an interesting substance. The amount of this resin is 67·3 per cent., and it darkens on keeping.

Water digested on the residue dissolves out 6·9 per cent., of colouring matter and salts. It contains no arabin. The remainder, 23·1 per cent., consists of dirt and particles of chopped grass. This also is quite free from gummmattery.

Summary :—

Fat, soluble in petroleum spirit.....	3·1
Resin, soluble in alcohol.....	67·3
Extractive and salts, soluble in water.....	6·9
Accidental impurity.....	23·1
.....	100·4

A second sample, treated with alcohol direct, yielded 70·8 per cent., to that solvent.—(*J. H. Maiden, in Pro., Linn. Soc. N. S. W.* 1889.)

NOTE.—We reprint this with the suggestion that such of our readers as live on the Indian sea-coast where *Spinifex squarom* is common, might ascertain whether it has any similar products. Dr. Watt does not mention any.

HON. ED.

The preserving of Wood, an Improved Process.

There has just been introduced into England by Colonel Haskin, an American gentlemen, a process which bids fair to quite revolutionise the method now in use of preparing wood for buildings, railway and other purposes. Formerly our method of seasoning the material has been by the extracting of the sap either by the natural process of dessication by time and exposure to the atmosphere, or by artificial means, such as kiln drying' steaming, washing &c., but as Bessemer reversed the then existing treatment in the making of steel, so Colonel Haskin has reversed the mode of seasoning wood. On Monday at 2, Dean's Yard, Westminster, the offices of the company, an opportunity was afforded a large company, of inspecting numerous specimens of material which have undergone what has been termed the "vulcanising" process, and having described to them the means whereby wood of all kinds can be made lasting and durable in a comparatively short space of time. The main principle of the Haskin system, as differing from the processes of Keyan, Burnett and Bethel, is that to effectually preserve timber is to so treat the sap within the pores of the wood that the whole of its life-preserving properties are retained and solidified within the substance

itself. It has been shown that by burning or charring timber, as was done in olden times, the liquid matter near the surface was arrested by fermentation, therefore the inference drawn by the inventor of the new process is that if heat were put to the centre, the core of the stick, the entire body would be entirely preserved. The wood, it was pointed out, may be taken in its green state, and the various compounds then in the sap are by great heat and air-pressure distilled and retained within the wood without losing their antiseptic and preservative properties. The process is simply the passing of the wood through a cylinder 6½ft. in diameter, the length of the tank being 112 ft. There it is subjected to compressed air for a length of time, and to a high temperature of from three to five hundred degrees, care being taken not to permit of the evaporation of the substances. By this means all the albuminous, glutinous, resinous, and oleaginous compounds become coagulated in the pores of the wood, and impregnate the whole substance. It is claimed that the high heat to which the wood is subjected does not affect the fibre and impair its strength; rather the reverse, for so long as the moisture is absorbed in the wood the fibre does not feel the heat. It was stated by the Colonel that the principal cost was that of the labour of getting the timber piled upon the trucks and run into the cylinder. The fuel necessary for raising the heat runs from 8 to 10 tons per twenty-four hours for 20,000 cubic feet of timber. As to the expense, Colonel Haskin stated that his process was much cheaper than even that of creosoting. The Colonel, while describing his system, referred in graceful terms to the efforts made by English scientists in the direction of wood-preserving. A number of cheap wood railway sleepers which has been exposed to the severest of weather and the heaviest of traffic for over ten years on New York and Boston railways were shown in a splendid state of preservation, and which, when the "bit" was applied, exhibited an interior of remarkable freshness. There were also on view some beautiful American woods of very close grain, and which, it was explained, were, after the vulcanising process, easily planed and tooled by the workmen. Judging from the exhibition at Dean's Yard, and the general opinion expressed at the inspection, there seems everp prospect of a great future in this country for this improved process of wood preserving.—*Railway News.*

The Preservation of Timber.

Colonel S. E. Haskin has contributed an able letter on the preservation of wood to the columns of a technical contemporary, in the course of which he explains the process with which his name is identified in the following terms;—

"Haskinising, vulcanising," consists in placing raw wood in a cylindrical chamber made of boiler plate, of any size, or numbers of them placed together, according to the put-out required daily, and submitting the same for a few hours to a medium of superheated, circulating, compressed air, making as many as three or four charges per day of twenty-four hours, the effect of which is to destroy all germs inherent in the sap, at the same time developing the antiseptics and preservatives contained in the wood, which, by the air pressure employed, are prevented from escaping, and in cooling down under the same pressure as is employed in producing them they became fixed in the wood.

Will you kindly allow the following endorsements to appear in connection with my explanation :—

Mr. C. F. Chandler, Ph.D., of the School of Mines, Columbia College, New York, says :—"I have examined the sample of oakwood preserved by your process, which you placed in my hands. I find that it is entirely different from the original wood, of which I also examined a sample. The treatment to which the wood has been exposed has effected a radical chemical change in its character, and it now contains 11·91 per cent. of materials, most of which have resulted from the action of heat. These I have succeeded in separating into: Neutral oils, turpines, &c., 0·36 per cent.; resinous acids and other bodies, 10·78 per cent. a very considerable portion of this 11·91 per cent. of material consists of antiseptics and preservative substances, which will act to protect the wood from decomposition and decay. They have also radically changed the appearance of the wood, producing what would otherwise have required a long lapse of time. The wood before treatment does not contain the above-mentioned substances, and would be liable to be attacked by microscopic fungi, and to undergo decay when exposed to air and moisture. In conclusion, I will say that your process seems to be a remarkably simple and effective one for improving the appearance and very greatly increasing the durability of timber, and protecting it from the agencies which result in destroying by decay timber which has not been treated.

Mr. R. H. Sloan, Chief Engineer, Manhattan Railway, tells me in reply to my inquiries as to the life of my cross-ties and planking which had been treated by the vulcanising process, timber so treated six years ago "is sound, and the surface of the ties 'and planking vary hard. There are no indications of decay at the 'end of those planks which were vulcanised, while the planks not 'treated and placed on the structure about the same time are 'decayed at the ends, or where they are nailed to the supporting 'timbers.— I am inclined to think the process of vulcanising will soon be found to be the best way of preserving timber."

Distillations of wood are obtained, one after another, according to the degree of heat and vacuo employed. On Mont Blanc, at some seasons of the year, ebullition, or boiling of water, will take place,

and the water evaporate, whilst it is not hot enough to cook ordinary vegetables. The air pressure being so much less at that altitude than 15lb to the square inch, the ebullition occurs for want of air pressure. The air pressure used in my process prevents ebullition, consequently a greater heat can be applied to the wood without causing destructive distillation or in any way injuring the fibre.

When the tree has been separated from its roots, the sap still contains the principle of vegetation, which by certain influences are brought into activity, causing every species of decay. This *vis vitæ* is the albumen in the sap.

The albumen in the sap of wood often produces a thread-like growth found in railway sleepers, extending throughout and terminating frequently at the end of the timber in a fungus formation. This mycelium destroys the vitality of wood. A good example of its growth I found near Manchester in some timbers which had been creosoted and used for railway sleepers, and afterwards taken out from under the rails and made into a fence at a crossing by placing the timbers on end close together.

A portion of the surface of the sleeper broken away, revealing the threads of mycelium interlaced in a perfect network following the course of the cells and ducts of the wood, which, except as to a thin surface, where the creosote had penetrated, was completely rotted.

By my procees of conserving timber, the vegetating or life-giving principle of the sap is destroyed by the great heat to which the wood is subjected. An experience of ages has shown beyond all question that "charring" wood will preserve it from decay; so far as the heat penetrates beyond the flame line it will invariably be found sound, firm, and strong, for the reason that the vegetating principle in the sap has been destroyed, but in charring, the heat cannot penetrate to the centre of the timber without burning too deeply, hence the circle around charred fence posts and timbers remains perfectly sound, while the centre has rotted away, whilst in my process the heat is made to the very centre and the fluids are so held confined by pressure that none of them can escape the action of the heat.—(*Timber Trades Journal.*)

A Norwegian House in England.

Writing in the *American Architect*, Mr. A. T. Sibbald says:—A friend of mine in Devonshire, England, being compelled in the course of last year to build a house, and finding that the estimates submitted to him for plans of the usual kind exceeded what he was willing to spend, bethought him of what he had seen of houses in Norway. An application to an architect in Christiania brought him several plans, one of which happened to be a plan of a house in Bergen, which he had inspected and admired. This plan, after a few modifications had been made in it, was adopted.

An estimate and specifications were then obtained from a builder in Christiania, who undertook to erect the framework of the house, to pull it down, and to deliver the materials duly numbered and prepared for transport and reconstruction alongside a ship which the purchaser was to charter. The order for the house was sent in January, and within three months it was ready for transport. Some delay was incurred in getting a vessel, and it did not leave Christiania till May 18th. A tedious voyage further delayed its arrival in England till the same time in June. It was then conveyed by railway to its destination, and on June 28th the work of re-erecting it was begun. Early in the month of December it was ready for occupation, though, owing to the dampness of the Devonshire climate, it was found expedient to delay until the spring the putting on of the outer shell.

While the house was in course of construction at Christiania, certain necessary works of preparation had been going on in England. The cellars had been made in the usual way, a stone wall on which the wooden structure was to rest, rising about 4 ft. from the ground, was built, and the brick flues of the house had been in part erected.

The walls are made of pinewood about 6 in. thick, the interstices of the logs being filled with oakum, and the whole surface being plastered with a mixture of cow-hair and lime. Outside the main wall there is a shell of wood, which is protected with paint against the action of the weather, and again inside there is another shell, which serves as a panelling to the rooms. By staining and varnishing this a good effect is produced. The cornices are carved by the use of the ricand saw in devices of excellent taste. It should be noted that neither paper for the walls nor plaster for the celling is used throught the house. It is important to observe that everywhere the logs of timber are placed vertically, an arrangement which adds somewhat to the expense of the building, but which, as the contraction of the wood in drying is not lateral but vertical, prevents the unevenness so often to be observed in the woodwork of English houses.

To avoid the resonance which might be expected in a house so constructed, dry sand to the depth of four inches is placed between the ceiling of the cellars and floors of the ground rooms and again between the ceilings of these and the floors of the rooms above. In addition to this, the floors of both stories of the house are laid with deals two inches thick, a millboard being placed under each, with the effect of thoroughly deadening all sound.

The house, which presents externally the appearance of a handsome villa residence, brighter, indeed, in colour than we commonly see in England, is an oblong of about 74 ft. by 56 ft. On the ground floor, besides the kitchen with its offices, butler's pantry, front and inner hall, there are these principal rooms :— Drawing room, 29 ft. by 16 ft. ; second drawing-room, 24 ft. by 15 ft. ; library, 16 ft. by 12 ft. ; dining-room, 24 ft. by 20 ft.;

business-room, 16 ft. by 14 ft.; ante-room, 12 ft. by 12. All the rooms on this floor are 13 ft. in height. On the first floor, which is 10 ft. 6 in. in height, there are: —Day nursery, 26 ft. by 13 ft.; night nursery, 13 ft. by 12 ft. 6 in.; bath-room, 15 ft. 6 in. by 13 ft. 6 in.; bedroom, 24 ft. by 21 ft.; ditto, 24 ft. by 21 ft.; ditto, 21 ft. by 15 ft.; ditto, 15 ft. by 14.; ditto, 15 ft. by 13 ft.; ditto, 22 ft. by 11 ft. All these are furnished with stoves. There are also two wardrobe-rooms, each measuring 15 ft. by 13 ft., one of which has a stove, and may be used as a bedroom, and linen-room 14 ft. by 7 ft. If may be observed that there is room and opportunity for constructing attics in the roof, an addition which may be more easily made owing to the circumstance that the slates are laid not on laths and battens, but on panelled wood.

Now as to the cost. The stone foundation-wall cost 300 dols.; the builders' estimate, including sixteen stoves, doors, window-frames, door-handles, locks and other fittings, amounted to 4,385 dols.; the sea-freight was 1,020 dols., to which something must be added for carriage by railway; a fee of 560 dols. was paid to the architect, and to these sums must be added the cost of window-glass, slates, &c. The total cost will be something under 10,000 dols. The estimates previously obtained for a stone house containing about the same amount of accommodation had reached the sum of 23,000 dols.; extras, an important item in building expenses, not being included in the amount.

Probably the first question which every reader will ask is this: "But will not a house of wood be especially liable to fire?" That houses of wood generally are so liable is certain, but it is possible that proper precautions taken in their construction and management may very materially reduce the risk. A practical proof that some such result may be attained is found on comparing the Norwegian with the English charge for fire insurance. In England, the rate of an ordinary risk is 1s. 6d. per cent.; in Norway, it is one dol. (4s. 6d.) per thousand dols., or 2s. per cent.; an excess not indicating a much greater damage, and, in fact, easily to be accounted for by the smaller amount of business transacted by the Norwegian fire offices. One fertile source of danger is removed by the total separation between the flues and the rest of the building. That common cause of fire, the beam heated by too close proximity to a fireplace, cannot exist in a house constructed as has been described above. Safety is also provided for by the substitution of stoves for the grates commonly used in England. When we speak of stoves, however, it must not be imagined that the Norsk stoves are of the kind called the "close" stove. In the principal sitting-rooms they use them so constructed as to allow the luxury, which nothing but sheer necessity will make an Englishman relinquish, of an open fire. At the same time, it is evident that such a house having once taken fire would burn very rapidly and would be completely destroyed. It

would be wise to provide ready means of escape for the inmates. Another obvious precaution would be not to raise such a house to any great height, or certainly not use as a sleeping room any chamber that might be constructed above the first floor.

Doubts about the durability of such a structure may be more satisfactorily disposed of. The climate of Norway may be supposed to be more trying than that of England to wooden buildings. Not only are there greater varieties of temperature, but the average rainfall is higher than in England. At Bergen, for instance, the average is 89 in.—more, certainly, than falls in any English town. Yet, as a matter of fact, wooden erections of considerable antiquity are not uncommon in the country. Dwelling-houses may frequently be seen there which, though very old, appear as sound as when they were first erected, and it is certainly true that whether old or new they do not need the incessant repair which in England so considerably increases the total of a householder's rent. But whatever may be the age of Norwegian dwelling houses—in England there are few which are as much as two centuries old, and of these a considerable proportion are of wood—the churches afford incontestable proof of the durability of wooden buildings. The church at Hittedal—to mention two only out of the many instances which might be cited—was built in 1,300, and that of Fortundal is said to be eight hundred years old. These figures may possibly be exaggerated, but there are certainly gigantic pieces of timber in this structure whose history may be traced back for many centuries. These timbers are in the interior of the church, they are not painted, and they appear as fresh as if they had been cut down a year or two ago, no trace of worm or dry-rot being observable in them.

To sum up. It seems that an English purchaser can import a house from Norway for something less than half the sum which it would cost to build one in England in the usual way. It appears, also, that this house may easily be made of handsome appearance, both within and without, wood being more susceptible than either stone or brick of an ornamentation which is at once tasteful and cheap: that it will be somewhat less liable to fire, but pretty certain should fire once lay hold of it to be rapidly and totally consumed; that it will be cleaner, will need less repair and will in all probability be equally durable.—(*Timber Trades Journal.*)

The Forests of British Malaya.

According to a recent report of the United States Consul-General at Singapore, in the dense jungles that still cover a vast portion of the Malay Peninsula and the adjacent islands there exist many rare and valuable forest trees indigenous and peculiar

to this region. Of these the nine best known lumber-yielding varieties are thefollowing :—

Seriah (*Hopea*) —This is a tall, handsome tree, with wood of a light-red colour, resembling coarse cedar in grain, much used in house-building for joinery work, but not suitable for beams and joists.

Mercanti.—An inferior variety of the preceding.

Telutong (*Dyera costulata.*)—This is a large tree with soft, white wood, used for models, cases, and work where strength and durability are not essential.

Darrou (*Sideroxylon sundaicum*).—A heavy, close-grained wood, resinous and aromatic, which, though well adapted to carpenters' work, does not resist exposure to the weather sufficiently well to admit for being used to advantage in external constructions.

Balan (*not scientifically determined*).—A fine, large forest tree, 60 to 100 ft. in height, and 3 to 6 ft. in diameter, with hard, heavy, close-grained, tenacious wood of a light-brown colour, much used for joists and beams, and for all purposes where strength and durability are required.

Tampinis (*Sloctia Sideroxylon*).—A close-grained wood of rich brown colour, susceptible of a high polish, and closely resembling mahogany ; most highly prized for joinery and building purposes on account both of its great durability and of the fact that it is not affected, as are other woods, by the ravages of the white ant, so destructive to timber in these latitudes.

Karangie (*Dialium indicum*).—A tall handsome tree, often found growing to a height of 60 ft., with a diameter of 4 ft. Its wood is hard, dark-coloured, durable, and often finely grained. It is used for furniture, and to a certain extent, for building purposes.

Damarlant (*Canarium sp.*)—One of the great Malayan forest trees, especially plentiful in the neighbourhood of Penang, where it is much used for housebuilding. Its wood is light-coloured, close-grained, and lustrous, and is admirably suited for beams and joists, on account of its great transverse strength and stiffness.

Mirabou (*Afzelia palembanica*).—A large, majestic, leguminous forest tree, with tough durable, beautifully-grained wood, susceptible of a fine polish, and well adapted to furniture making.

The kinds most extensively handled as lumber in the Singapore market, and the prices per ton of 50 cubic feet, are the following, the prices being quoted in Mexican dollars :—Seriah 14 to 25 ; Mirabou, 30 to 45 ; Telutong, 15 to 20 ; Darrou, 20 to 25 ; Balan. 25 to 35.

In addition, there is a considerable amount of teakwood imported into Singapore, mainly from Burmah and Siam, which commands on the spot from 40 dols. to 65 dols. (Mexican) per ton. (*ibid.*)

Churchill and Sim's Circular.

5th December, 1895.

EAST INDIAN TEAK.—The deliveries for the first eleven months of 1895 have been 17,003 loads, as compared with 10,071 loads in the eleven months of 1894. In November this year they amount to 1,684 loads, and in November last to 759 loads. The stock has decreased a little in the month, but prices are quite stationary, waiting for a settlement of the slip-building strike on the Clyde and at Belfast, in the hopes of then participating in an improvement in general demand.

The Navy demands have not been more than sufficient to absorb supplies as they have come to hand, without raising prices.

ROSEWOOD.—East India.—The demand is rather quiet and the market is sufficiently supplied with stock, which, however, is firmly held.

SATINWOOD.—East India.—Is quiet, but stocks are not at all heavy.

EBONY.—East India.—The stock is limited to one parcel, but the demand is rather quiet.

PRICE CURRENT.

Indian Teak	per load	£10.	to £16.
Rosewood	„ ton	£ 6.	to £ 9.
Satinwood	„ sup. foot	6d.	to 12d.
Ebony	„ ton	£ 6.	to £ 8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, December, 1895.

Cardamoms	per lb.	1s 10d.	to 2s 8d.
Croton seeds	per cwt	48s.	
Cutch	„	20s.	to 32s.
Gum Arabic, Madras	„	20s.	to 33s. 6d.
Gum Kino	„	£25.	to £30.
India Rubber, Assam,	per lb	1s. 7d.	to 2s. 2d.
„ Burma	„	1s. 6d.	to 2s. 2d.
Myrabolams, Bombay,	per cwt	7s. 6d.	to 7s. 9d.
„ Jubbulpore	„	6s. 3d.	to 7s.
„ Godavari	„	5s.	to 5s. 6d.
Nux Vomica, good	„	3s.	to 8s.
Oil, Lemon Grass	per lb.	2d.	
Orchella, Ceylon	per ton	11s.	to 15s.
Redwood	„	£4	to £4-10.
Sandalwood, logs	„	£30	to £50
„ chips	„	£4	to £8
Seed lac	„	50s.	to 160s.
Tamarind	„	9s.	to 11s.

THE

INDIAN FORESTER.

Vol. XXII.] February, 1896. [No. 2.

An Injurious Insect in Jodhpur.

Under the above heading, Pandit Gokal Das, Supt. of Forests, Jodhpur, in the October Number (1895) of the *Indian Forester*, asked for suggestions as to the methods to be employed in the destruction of a locust-like insect reported to be attacking a plantation of young mango trees. The insect in question was forwarded by him to the Entomological Department of the Indian Museum, Calcutta, for identification and for suggestions as to means to be taken for its destruction. It was identified by the Deputy Superintendent as *Pylotropidius didymus*, an Orthopterous insect of the family *Acrididæ*. He apparently made no suggestion as to means for destroying it, but mentioned that the insect had not previously been reported as destructive to agriculture. As any new attack from an insect previously unrecorded as a pest is of interest and more especially so in this case when it is the life of a young plantation that is at stake, I wrote to Pandit Gokal Das asking him if no other insects were to be seen on the mango trees at the time of the attack by the locusts and also as to date of his letter to the Superintendent, &c. My reason for these questions was that I thought damage might be due to one or other of the two Heterocera, *Nutada velutina*, Kollar, a Limacodidae or *Artaxa limbata*, Butler, of the family Liparidæ which both attack the foliage of the mango. In answer, the Pandit stated that no other insects appeared to be attacking the trees except occasionally white ants. He very kindly forwarded me at the same time some specimens of *P. didymus* and some young mango plants which were said to have been killed by the insect. Some of the Sangtra plant was also received, which is stated to be growing amongst the mango and to be unattacked. A cursory examination of the stems of the mango trees showed me that the damage was not due to the work of White Ants. The damage was first noticed about the second week in May and the letter to the Superintendent at the Calcutta Museum was written on May 23rd.

These dates are important as helping to give colour to the statement that *P. didymus* is the aggressor.

Acrididae mostly hibernate as perfect insects during the cold months of the year. In April and May they begin to be *en evidence* again and about the middle of May to end of June, the period of course varies, they couple and eggs are laid.

I am unacquainted with the life history of the insect in question and can find no mention of it in the Indian Museum Notes, but the above is the typical life-history of the family.

Pandit Gokal Das states that 'about two acres of the plantation were burnt and the ashes were sprinkled over the mango plants' and says that no more insects were found after this. This absence of the insects was more probably due to the fact that the mature ones after coupling had died off and only the egg stage was present, than to any wholesale destruction the burning of a small area would have if the attack were at all a bad one. Again he says "since writing the above, the insect has again commenced its ravages, having stripped some plants completely of all their leaves." These new insects would probably be the young brood hatched out from the eggs.

I have examined the young stems with roots sent to me: the plants were two years old, one year in the nursery and one year in the plantation, and were from 18 inches to 4 feet in height. There is certainly no mistake as to the damage done to the young stems, the bark having been in places often completely ringed off. The stems have been attacked in three ways. On some, the bark has, as above mentioned, been singed completely round, resembling some Coleopterous attacks. On others the bark has been eaten off in great angular patches whilst on a third stem I noticed the bark was hanging in long shreds all round the wood of the young stem. No leaves were on any of the young plants received by me, though several of them had the appearance of being not long dead.

The species of plant called sangtra sent was unknown to me, but appeared to be leguminous. Its root branches into several main stems at the surface of the ground. At this juncture, at a point which I should think would be just beneath the soil, I found a mass of eggs which are very like the eggs of some of the larger Acrididae known to me, though smaller is size. The eggs were attached together by some cohesive substance, were yellow in colour, rounded in section, about ·1 to ·15 inches in length and tapering very slightly at each end. They appeared to be rather dry and shrivelled up, and I should say there was no chance of these hatching out, especially as it would seem to be late for eggs.

The fact that neither the young Jaman (*Eugenia Jambolana*) plants which are either growing amongst the mango trees, or near by, nor the sangtra which is growing amongst the attacked plants have been touched is curious, as locusts are pretty well omnivorous where plant life is concerned.

Remedies—As to the remedies to be employed. This is always a difficult question to deal with as so much has to be taken into account. They are numerous enough but their application depends both on the means at one's disposal and also on the extent of the area to which they are to be applied. In this case, burning the sangtra amongst the mango plantation, has the effect of ridding the *area burned over* of the pests, but its effect on the whole area will depend very much on the proportion of area burned over to that over which the attack is spread. It is perhaps superfluous to remark that burning operations carried out in a young plantation of trees, are not exactly compatible with the production of strong and healthy plants.

In a case like the present, I should think there are four remedies which might be successfully tried, though they must necessarily depend on the extent of the plantation and the amount of labour procurable, of both of which I am in ignorance.

The remedies which I think might be tried are :—

(*a*) Hand-picking—Provided labour is procurable—a large number of insects should be got rid of in this way. In the cold weather invasion of 1890-91 of the locust *Acridium peregrinum* the villagers of Peshawar turned out and some eighty million young insects were destroyed at a cost of about 8,000 rupees, or 10.000 per rupee. This hand-picking should be commenced as soon as the insects are noticed on the trees so that they may be killed before their eggs are laid.

(*b*) Hoeing—If possible hoe up the ground after the eggs have been laid in it. The eggs thus get buried and if the young locusts do emerge they cannot force their way up through the superimposed layer of soil.

(*c*) Irrigation—I understand that a part of the area is watered by irrigation channels. If towards the close of the hot weather this part of the plantation can be kept under water for a period, all the young generation of the *P.didymus* present on this area, would be destroyed. After hatching, the young insects spend some days in a wingless state during which period they can only crawl.

(*d*) Weed Fires—If there is any wind, good weed fires giving forth a dense smoke should be made in favourable positions, so that their smoke may be carried across the plantation. This will make the locusts move off the area. A search should be made soon afterwards and any stupefied ones killed.

If any of the above methods are applicable to the plantation in question and can be inexpensively employed, I should think that the young trees might be saved this year from the ordeal which they had to go through last. I should be interested to hear the results attending the employment of any one of them.

CAMP RAIANG, TISTA VALLEY.
9th January, 1896.

E. STEBBING.

Re-afforestation of the Mahasu-Fagu Ridge.

By

PUNDIT SUNDER LALL PATHAK.

Description.—The Patiala portion of the Ridge, called the Rajendra Rukh, is reached by the Hindustan-Thibet Road at Kufri, 7 miles from Simla due east. From Kufri to Fagu it is about 4 miles by the same road which passes along the northern slope of the ridge. Both places are on the Sutlej-Jumna water-parting, which runs nearly straight between them, forming the boundary between the Keonthal State on the north, and the Patiala State on the south slope; the latter State also owns a small portion of land on the north slope near Kufri. The water-parting of the ridge ranges approximately from 8,000 to 9,000 feet in altitude.

The northern slope is fairly regular, and moderately steep, whereas the southern slope is interrupted by several well-pronounced spurs, which give rise to a variety of aspects, especially a main spur, which branches off from this range southward from Chini-ka-theka (above Kufri), called the Manoon spur. The western slope of this spur is in the Simla Waterworks Catchment Area, and the eastern in the Rajendra Rukh or Patiala portion. This Patiala portion of the Mahasu-Fagu Ridge is drained into the Chher-Nal which joins the Giri river. This Nal has an altitude of 6,000 to 7,000 feet above sea level.

The sub-soil of the ridge is generally an argillaceous shale, which though it is fairly hard, weathers somewhat rapidly, and is usually much disintegrated at the surface.

The surface soil is a stiff clay resulting from the decomposition of the sub-soil. It is deep on the north, and superficial on the south, where, on certain precipitous spurs, quartzite crops out. The soil on the Manoon spur is fairly deep, and has the same composition as that on the Mahasu ridge, but is to a certain extent richer, with more leaf mould. The average annual rainfall is from 70 to 80 inches; the greater part of the rain falls from the 15th June to the 15th September. Snow generally falls in January and February, and is sometimes found till the end of March on the northern slopes.

Above 6,000 feet, and up to the highest points on the range the principal species of tree are :—

Kailo or deodar (*Cedrus Deodara*), kail or blue pine (*Pinus excelsa*), rau or spruce fir (*abies-Smithiana*), ban oak (*Quercus incana*), moru oak (*Quercus dilatata*), kharshu oak (*Quercus semecarpifolia*).

Of the above-mensioned species, deodar and kail grow freely on the southern slopes of the ridge and on the Manoon spur in Patiala Rajindra Rukh, and on the crests of the ridge on

the north slopes up to within a short distance of the highest points.

Besides the above described species, there are several less important trees and shrubs growing on the Mahasu-Fagu Range. Amongst the latter should be noted the beons (*Salix elegans*), a large shrub which grows well in almost all situations. Pindrau or silver fir (*Abies Webbiana*) and kopru (*Acer cæsium*) grow in a few elevated depressions.

Wherever the soil is deforested, and is not cultivated or much grazed over, it becomes covered with a thick growth of underwood, consisting mainly of *Berberis*, *Indigofera*, *Escholtzia*, &c., on the southern, and of *Berberis*, *Rubus*, *Prinsepia*, &c., &c. on the northern slopes.

This underwood favours the establishment of self-sown blue pine and spruce fir seedlings, and effectively prevents erosion.

Previous History.—The whole of the Mahasu-Fagu Range was more than 35 years ago thickly covered with a high coniferous forest mixed with the three Himalayan oaks, and occasionally with other evergreen trees, generally having a girth from 10 to 15 feet; survivors of these, and many burnt stumps can still be seen, both in the Patiala and Keonthal States.

When the population of Simla commenced to increase, and the demand for timber increased, the timber merchants (Kangra Sudhs) first of all commenced to work out the forests nearest to the station; and this range is one of the forests which were very heavily worked, and these merchants then paid here absurdly low rates, such as 4 to 8 annas per tree.

In the meanwhile, it was discovered that the colder situations were more suitable for potato cultivation, and within the next few years, almost the whole of the northern slopes, down to an altitude of 7,000 feet, the summit of the ridge, and other suitable and cultivable sites on the range were disafforested. Almost the whole area was laid out in potato fields; which were slightly levelled, and were unsupported by any stone work. These fields, after producing two or more crops, showed signs of exhaustion, the cultivators had recourse to manuring and were obliged to continue it. For this purpose they kept an enormous number of cattle, and large flocks of sheep and goats which were principally fed by lopping the surrounding valuable forest trees. By and by, when this sort of manure proved insufficient, and wood ashes were found to be a good substitute, nearly all the trees were cut down and burnt, to furnish ash manure. The cultivation of potatoes was continued with success up to 1879-80; the cultivators were mostly emigrants from Bashahr, Mandi and Kulu, and Sudh shopkeepers from Kangra. They only paid a nominal rent of 10 annas per bigha to the States.

Since 1881, the potato crops have been more or less failures, though for the last few years, crops have not been so bad on account of the introduction of some new seed. Thus the forest on

the range was gradually destroyed, and the ground was left quite bare. Owing to the heavy grazing, small landslips were continually occurring, and a large number of small torrents were excavating deep beds in the hill sides, and washing away the soil leaving here and there cropped-out shale and other rocks.

The Government of India called the attention of the Punjab Government in June 1885 and asked them to move in the matter of the reservation and re-afforestation of the Mahasu-Fagu ridge ; to meet the apparent necessity not only for extending the present catchment area of the Simla water works in order to supplement the existing number of springs but also to secure the permanency of the existing springs, which it was feared would diminish in their water supply, and the growing scarcity and increased cost of wood fuel and timber. The Supreme Government laid especial stress on the importance of these matters. Both these wants the Government of India believed could be met by the constitution of a closed forest including the northern and southern slopes of the Mahasu-Fagu ridge, and it was further considered necessary that a block of forest of 8,000 to 10,000 acres should be obtained free of rights for this purpose.

In July 1885, the Lieutenant Governor of the Punjab deputed Colonel C. Beadon, then Deputy Commissioner of Simla, and Mr. H. C. Hill, Conservator of the Punjab Forests, to inspect and report and at the same time directed the former officer to put himself in communication with the Patiala and Keonthal States with a view to the lease of their respective portions of the range. Colonel Beadon, on the 14th December 1885, forwarded to the Patiala and Keonthal states the copies of the correspondence received from the Supreme and Local Govenments indicating the feelings of Government in the matter, and asked for the lease of their forest lands on the ridge.

Colonel Beadon further asked the Patiala Darbar to make over to the British Government the whole of the Patiala parganah *Chhebrote* about 7 square miles in area, in exchange for the same area in British territory in the plains, or to lease it on a certain annual rent, which was not to be more than 2-3ds of the net revenue of the forest. The Patiala Darbar, in response to the above correspondence, said that the State had always deemed it a great honour to be of some use to the Government, and it had ever been their desire to comply with the request of the Supreme Government. The Darbar, however, for obvious reasons, did not like to be deprived of the possession of the land in question but would prefer to carry out the scheme aimed at by the Government at their own cost, and thus save the Government from incurring a needless expenditure.

To satisfy the Government in carrying out their wishes, the State agreed to spend an amount of money, to sacrifice and to

sustain any other loss on the reservation and re-afforestion of the ridge, and accordingly issued orders to their Chief Forest Officer. to submit his proposals on the subject for their sanction.

The Government, after due consideration on the Darbar's proposals, did not press further the subject of the exchange or lease of the forest, but in June 1887, consented to the offers made by the Durbar and deputed Mr. McIntyre, Assistant Conservator of Forests, Punjab, to inspect the ridge, and asked the State to depute their Chief Forest Officer to meet him on the spot to consider and submit their proposals to their respective Governments, which was accordingly done.

These proposals, which were all that could be desired, were in due course accepted by both Governments, thus saving the Patiala State from the loss of the territory, and the British Government from an unnecessary expenditure.

Proposal.—In the Patiala State, Mr. McIntyre proposed to reserve an area of 932 acres including the expropriation of 9 villages and Dochies (which area had about 200 acres of blanks and expropriated cultivation), out of which he proposed to sow with spruce fir and blue pine one hundred acres, in 10 years, leaving the remainder to nature. However, before receiving any communication on the subject from the British Government, the Patiala Durbar on the 4th December 1888, had sanctioned in full the proposals submitted by their Chief Forest Officer which involved an expenditure of Rs. 3,887 and an annual loss of cultivation revenue of Rs. 399.

The Patiala arrangements were identical with Mr. McIntyre's proposals, with the exception that they suggested the advisability of planting 200 acres, instead of 100 acres, the introduction of oak-sowing, and the formation of 6 fruit gardens on the expropriated lands between altitude 6,000-700 feet.

Results.—In the early spring of 1889, the State paid all the compensation, and declared the ridge reserved, and named it Rajindra Rukh, after the name of the present Chief. Then it was handed over to the State Forest Department for carrying out what they proposed.

After the evictions and demarcation had been settled, it was not possible during the first year to do more than start a few deodar and blue pine nurseries, and stock the 6 fruit gardens with the grafted apples, cherries, apricots, pears, &c., &c. which were kindly supplied by Mr. Coldstream, who was then Deputy Commissioner of Simla. Since 1890, however, regular plantation work has been carried on, an area of 30 to 40 acres being taken in hand every year. Thus there were two seasons every year for sowing and planting.

(1.) The rainy season, during which the sowing of kharshu oak (*Quercus semecarpifolia*) on the highest parts of the summit of the ridge in lines 5×5 feet was carried on; also the

transplanting from nurseries of kail, blue pine, on altitudes between 7,500 and 8,500 feet, and the planting of seedlings brought from adjoining forests, in traingular patches. This was followed by deodar transplanting in lines 5 × 5 feet both of plants from nurseries and also of seedlings brought from adjoining forests, on altitudes between 6,000 and 7,000 feet. In addition, willow and poplar slips or cuttings were put down at those places where denudation was in progress ; and rhizomes of Ringal (*Arundinaria falcata*) were planted in moist and shady ravines. These works were carried on yearly.

(2). In the autumn season *before* the snowfall, other works were done. Thus, in the autumn of 1890, as an experiment, at altitudes above 6000 feet, some walnuts (*Juglans regia*) were directly sown in well manured pits 1ft. × 1ft. × 1ft., in lines 5ft. × 8ft., and 8ft. × 12ft. apart. The seed was sown just before the snowfall, and was found germinating in the beginning of the following March, just after the snow cleared away. These young walnut plants made good progress during the following rainy season. Walnut culture was carried on very successfully in each succeeding year, and its adoption, in addition to the plants originally proposed, was made for 3 reasons :—(*a*) the soil appeared eminently suitable for its culture ; (*b*) its growth is more rapid than blue pine or spruce fir, and (*c*) its timber is of more value than theirs; and, in time, a certain income may be expected from its fruit. Besides this, the horse chestnut (*Æsculus indica*) was sown in pits 5 feet apart, in lines, and the lines at 6 feet apart ; also blue pine in horizontal lines 5ft. × 5ft. at and above 8,000 feet above sea level. Direct sowings of deodar were also made in pits 10 feet apart in lines and interplanted with peaches for shade during their early growth, between the altitudes of 6,000 of 7,000 feet. Firs were also sown in the same manner as the above conifers, but were afterwards abandoned on account of the greater success of the walnut. The moru oak (*Q. dilatata*) was also sown in the same manner as kharshu, but on lower altitudes ; the results, however, were not so satisfactory. As underwood, peach, apricot and other trees were planted for the sake of giving shade to the deodars, when young, and also in places where the soil was very poor, or much washed away, or too exposed..

Fruit Gardens. In the same way, in the fruit gardens plants were continuously raised from the best seeds, and offsets ; then were grafted and planted in permanent places. The fruit trees chiefly grown were the cherry, apple, pear, quince, almond, plum, peach, apricot and Spanish chestnut. These fruit gardens have grown up well with all the species of grafted fruit trees put in them in 1889, and those locally raised and grafted, which have commenced to bear fruit since 1894.

All the sowings and plantings detailed above were carried on every season, on the whole with remarkable success. There have been but few failures, and the cost has been far below the amount originally proposed and sanctioned.

The plantations were inspected in 1894 by Mr. G. S. Hart, Deputy Conservator of Forests, Simla, who expressed himself as pleased with the results of the work done. His report was endorsed by the Commissioner of Delhi and finally forwarded to the Maharaja with the expression of the Lieut-Governor's satisfaction. At the time of inspection, 180 acres were found practically stocked, and the most noticeable success was that of the walnut, the sowings of which looked very well.

Die Mathematik und der Wald.

A propos of a short poem with the above title in the October number of the 'Révue des Eaux et Forêts,' 'C.B.' makes some pertinent remarks with which I think many Indian foresters will heartily sympathize and which may serve to reassure some of those who have perchance become somewhat frightened of late at the mathematical intricacies of recently published works.

The article referred to contains several references of recent protests made by Italian foresters against the increasing abuse of mathematics in Forest matters. One of these writers while admitting the possible usefulness of abstruse mathematical calculations in the case of the large and valuable forest areas of Austria and Germany, maintains that these are at any rate quite out of place in Italy, where the problem to be solved is how best, in the interest of the agricultural population, to improve the condition and increase the extent of those, generally small or impoverished forest areas, which have escaped destruction. "Here" the writer states, "it is simply a question of Sylvi-'culture and Finance and not by any means one of Algebra."

If this principle is admissible in Italy, it would seem to be at lest equally applicable to India where the conditions are even less uniform and consequently still less favourable to the application of mathematical formulæ. The first duty of a Forest Officer in India is surely the improvement of the forests in his charge, while at the same time, he endeavours to utilize such material as may be marketable within such limits as are compatible with improvement.

Elaborate formulæ, however interesting their study may be for the theorist, will hardly assist one in attaining this end; and it is, I think, fortunate that European Foresters are beginning to recognize the danger of thus missing the substance while straining after the shadow, and that we in India have such a

practical little book as the late Mr. D'Arcy's Manual on the preparation of Working Plans for our guidance.

Though some of the writers referred to in the article by 'C.B.' are not perhaps altogether complimentary to the German teaching and to some of the celebrated German forest economists, one cannot help sympathizing with their protests. It is a noticeable fact that practical German officers too are beginning to deprecate this tendency to reduce all forest questions to a mathematical equation, indeed the author of the poem with which C. B's article commences is a German Forest Officer stated to be as well acquainted with mathematical formulæ as with economic laws and an officer of some repute in Alsace, one of best schools of practical forest economy.

AN INDIAN FORESTER.

II.—CORRESPONDENCE.

Forest Appointments in Bombay.

SIR,

The Government Gazette recently announced the appointment of a Conservator of Forests 2nd grade and a Conservator ot Forests 3rd, two appointments which have long been looked forward to by Forest Officers in this Presidency, and it is observed that Mr. McGregor of the Southern Circle has gained the former which promotes him from Rs. 1,100 to Rs. 1,350 and Mr. Wroughton, Deputy Conservator of Forests in charge of the Northern Circle obtains the latter which will give him Rs. 1,100 instead of Rs. 900. It may seem paradoxical to say so, but these appointments are not entirely new ones. In 1891 before the Department was re-organized, there were always three Conservators on the Bombay establishment, one appointment being in Sind. When orders for the re-organization of the Imperial and Provincial services was sanctioned in the latter half 1891, the peculiar feature of the scheme appears to have been the abolition of the Sind Conservatorship which has now, after considerable trouble, been re-created ; but Sind no longer retains the appointment, this goes to the Northern Circle, which comprises the Guzerat Districts and the Thana Collectorate and which was formed into a separate charge three or four years ago, making in all four circles in the

Bombay Presidency. A fourth Conservator, it is hoped, will yet be sanctioned for Sind, which as the Administration Report for 1893-94 shows, is in a very flourishing financial position and on behalf of which a special appeal for the re-creation of the post of Conservator was made by the Commissioner in Sind.

Forest Officers in Bombay have numerous grievances which require to be redressed. Promotion is exceedingly slow as compared to what it is in the Provinces under the Government of India and in Madras, and the more favourable pension rules by which an Officer who has rendered not less than 3 years approved service as head of his department, is made eligible for an extra pension of Rs. 1,000 a year, have yet to be applied to them. The rules have been extended to the P. W. D. and why they should be held in abeyance in the case of Forest Officers is not understood.

It is hoped all these grievances will soon be redressed and that a fourth Conservator will be added to the existing forest strength in Bombay.

January 16th, 1896. FOREST OFFICER.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Summary of Progress during the five years 1889-1894.

In accordance with the usual custom, the principal measures and events which have marked the progress of Forest administration during the last quinquennium are recapitulated as an introduction to the Annual Review for the year 1893-94.

2. The Department of Revenue and Agriculture of the Government of India continued to administer the Forest Branch of the general administration, and during the period under review the Honourable Members of Council in office have been Sir P. P. Hutchins, K. C. S. I., from April 1889 to November, 1893, and Sir A. P. MacDonnell, K. C. S. I., from November, 1893 to the close of the quinquennial period. Sir E. C. Buck, Kt., C. S. I., as Secretary to the Government of India in the Department of Revenue and Agriculture, conducted the Forest business throughout the period, with the exception of from the 20th March to the 4th October, 1890 and from the 7th August to the 30th December, 1892, when Mr. W. C. Benett and Mr. Muir Mackenzie officiated for him, respectively.

Mr. B. Ribbentrop, C. I. E., who continued to perform the duties of Inspector-General of Forests, was absent on furlough for nearly 19 months (August 1889 to March 1891), during which time Mr. H. C. Hill, Conservator of Forests, acted as Inspector-General.

3. There has been an increase in the area of permanently settled forest estates from 54,323 to 71,589 square miles, and much has been done in completing, on a strictly legal basis, the record-of-rights of both the State and the people to forest estates or their produce. As stated elsewhere, it has been the policy of Government, during the period under review, "to determine 'what area of forest or waste land in each district is necessary to 'meet in perpetuity the requirements of the people in timber, fodder 'or other produce, and to provide for its settlement and demarca-'tion as a reserved forest."

4. The Indian Forest Act (VII of 1878) and the Burma Forest Act (XIX of 1881) were amended by Act V of 1890, in order to provide for the exercise by the State of a greater control over all forest produce wheresoever obtained, and to regulate the practices of shifting cultivation and the compounding of offences. In 1891 a special forest regulation was passed for Assam to replace the Indian Forest Act, which was found unsuitable. Special regulations were also enacted in 1892 and 1893 for Ajmere and Merwara and for Hazara in the Punjab.

Of rules made by Local Governments, those made in the Central Provinces in 1891, under Act XVIII, for the conservation of malguzari forests, are deserving of notice,

Measures to afforest and check the disastrous effects on the underlying plains of the bare sand-hills of the Hoshiapur district were again brought under consideration, and it is hoped that a definite line of action will be decided upon, with a view to its adoption whenever money can be spared for the purpose.

5. Under forest organization much progress has been made during the quinquennium. Surveys have been carried out in the various provinces at a rate which has resulted in the mapping, on an average, of some 3,000 square miles a year. Working-plans have now been prepared for considerable areas, with the result that 7,754 square miles of forest were in 1894 being systematically worked under sanctioned working-plans. A work entitled "Notes on Forest Working-plans," compiled by the late Mr. W. E. D'Arcy, while holding the post of Assistant Inspector-General of Forests and Superintendent of Working-plans, and published in 1892, has proved useful in simplifying the more recent plans and giving to them that uniformity of preparation and record, without which the control of their application would have been most difficult, if not impossible. A new edition of the work is about to issue.

6. The general protection of the forests from theft and encroachment is an easy matter. Their protection from the destructive effect of fire, and from illicit or unregulated grazing, presents the greatest difficulties. Still much has been achieved. Under fire-protection, results cannot be gauged from year to year, owing to the variation in the seasons ; nor can they be compared from province to province, owing to the different prevailing conditions.

The extension of the protective measures which has taken place during the past five years, with the average failures and cost-rates for the periods of five years preceding and following the year 1889, are exhibited in the following table. They serve to indicate the progress in the different provinces :—

Fire-Protection.

Province.	Area attempted, in square miles.		Average percentage of failures for five years.		Average cost per square mile for five years.	
	1889-90.	1893-94.	1884-85 to 1888-89.	1889-90 to 1893 94.	1884-85 to 1888-89.	1889-90 to 1893-94.
					Rs.	Rs.
Bengal ...	1,217	1,171	19	14	14	9
North-Western Provinces and Oudh.	2,199	2,642	5	4	25	19
Punjab ...	427	318	6	9	5	7
Central Provinces ...	2,887	6,336	5	5	14	12
Burma (Lower) ...	379	566	15	7	58	59
,, (Upper) ...	12	62	...	33	...	42
Assam ...	1,057	1,153	3	12	34	16
Coorg ...	202	205	17	11	24	31
Ajmere ...	139	89	...	...	4	2
Total ...	8,519	13,242	9	9	19	16
Berar ...	1,059	1,389	3	2	6	7
Total Bengal Presidency	9,578	14,631	8	8	17	15
Madras ...	4,600	5,044	6	5	13	10
Bombay ...	10,638	9,809	10	15	...	2
GRAND TOTAL ...	24,825	29,484	8	10	8	9

The regulation of grazing has been systematised under working-plans, and wherever these have been prepared the necessary restrictions so imposed, after full consideration of requirements and the forest's capabilities, and enforced continuously over a number of years, come to be readily accepted by the people. In such cases it rests with the forest establishments to see that duly authorised closures of areas are properly carried out, and that trespass is prevented.

Large areas have still to be dealt with ; but with the advance of organised management, these will be gradually brought under such protection from cattle as the local circumstances may render necessary or possible.

7. The improvement of the forests by a course of improvement-fellings, made with a view to increasing the proportion of healthy promising stems in the crop, has been proceeded with wherever a demand for produce exists, or, in the absence of a remunerative demand, to the extent for which funds and superintendence were available. Aid has continued to be given to reproduction by means of the planting of teak in clearings made for shifting cultivation in Burma and the broadcast sowings in Bombay ; and the growing stock in the Himalayan forests has been improved and rendered more complete by planting and sowing.

The opening up of the forests by lines of communication and export, the expenditure on which is usually immediately profitable, has received special consideration in various provinces ; but there would seem to be scope and encouragement for the further investment of money in this direction.

8. The quantity of forest produce annually yielded by the forests and utilised has largely increased. It amounts in round numbers to more than 150 million cubic feet of timber and fuel, 130 million bamboos, and nearly 4 million rupees' worth of minor produce. These enormous supplies of produce represent as yet, however, only a fraction of what the State forests will yield hereafter. With a view to the development of a more extended utilisation of the forests, cheap handbooks edited by the Reporter on Economic Products containing useful information on raw products, are now issued.

9. Financially, the progress of the past five years has been well sustained. The gross receipts have advanced from 139 to 177 lakhs of rupees, while the surplus has increased from 57½ to 83¾ lakhs. Some grounds for doubt would seem to exist as to whether so large a proportion of the gross receipts should be appropriated by the present generation, or whether more should not go towards the improvement of the capital value for the benefit of the future.

10. The reorganization of the controlling staff sanctioned in 1891 was a measure of much importance, but unfortunately its full beneficial effect is held in check for want of a more efficient subordinate forest staff, the reorganization of which was in fact a part of the same scheme.

The desirability and economy of entertaining both executive and clerical establishments of a strength to meet requirements, including the best utilisation of the controlling staff, are recognized by the Local Governments, by whom repeated representations have been put forward on the subject.

11. The course of training in the Forest Branch of Coopers Hill College has been extended from two to three years, in order to admit of a more extended practical training on the continent. An arrangement has been introduced by which Indian Forest Officers are afforded facilities, when on leave, for visiting forests and studying the progress made in Europe. The constitution and scope of work of the Imperial Forest School at Dehra Dun have been improved and extended, the curriculum of studies and the examinations now being controlled by a Board, representative members of which assemble each year at Dehra Dun for the purpose of conducting the final examinations and disposing of all important questions connected with the Institution.

12. Of minor events and administrative changes the following may be cited. A fourth edition of the Forest Department Code, with Appendices, was issued in 1892. A forest year, beginning on the 1st July and ending on the 30th June, has been substituted for the financial year for the purpose of the Annual Forest Administration Reports.

The Central Provinces have been divided into two circles and a second Conservator appointed; while in Burma four circles have been formed with four Conservators. Madras has three circles, held by Conservators; and Bombay with Sindh has been sub-divided into four circles, of which two are for the present in charge of senior Deputy Conservators.

The Government of the North-Western Provinces have appointed their senior Conservator at Naini Tal *ex officio* Deputy Secretary to Government in the Forest Department, an arrangement which, if successful, might with advantage be extended to other provinces.—(*Introduction to the Review of Forest Administration for 1893-94, by H. C. Hill, Officiating Inspector-General of Forests.*)

IV.—REVIEWS.

Wood-working Machinery.

"Modern Wood-working Machinery" by. J. Stafford Ransome, and published by William Rider and Son, 14 Bartholomew Close, London, E. C., although of special interest to persons owning large Saw-mills, is also very useful reading to foresters. We suppose that "Rider's Technical Series," of which this little book forms part, allots fixed limits to the space to be given to each particular head—otherwise we should have felt the sense of disappointment that an author who is evidently so thoroughly well versed in the details should not let himself out more and give

us a further account of the different matters of which he writes. We think such a book would be valuable. There is a good deal in Mr. Ransome's book with which we have not much concern, as the Chapters on Tenoning and Mortising machinery and others, but all connected with Saw-mills, tree-felling, and the handling of timber will repay our perusal. The tree-felling machines are especially curious. It is true that hitherto Saw-mills have not been found successful in Indian Forests, yet there are firms in Calcutta and Bombay, and in the large coast towns of Burma, where Saw-mills are working, and it may be that the rise in price of labour, the increased output of the Forests, and the improvement in communications, may some day again lead the Department to set up mills. One would not think that the Vosges was an exceptionally likely place for Saw-mills to pay in, yet what numbers of them there are. As a suggestion—how would a Mill pay in the Andamans ? but perhaps it is better to leave such things to private enterprise.

Forest Administration Reports for 1893-94 for Bombay, Baluchistan and Burma.

The forest area in the four circles of the Bombay Presidency now amounts to 14,100 square miles Reserved and Protected. They are divided as follows : —

Northern Circle	1,589	}	but the Northern Circle has also 678 square miles of leased forest in the Dàngs.
Central „	6,157		
Southern „	5,372		
Sind „	982		

In the Central Circle Report there is a discussion of the question of the sufficiency of the forest area and it is shewn that forests cover 16 per cent of the country and that there are 0·63 acres per head of the population, which are almost exactly (see Schlich's 'Manual of Forestry, I. p 54) the same proportions as exist in France. Mr. Shuttleworth says :—

"These figures may provoke reflection as to whether the 'State forests which have been formed are sufficiently extensive, 'and in their spread are suitably located in all directions to pro-'mote all the interests, and to maintain all the harmonies depen-'dent upon an efficient system of forest conservancy management 'in a country circumstanced and conditioned as the Central Division 'of this Presidency, where the rainfall is at all times uncertain and 'capricious, and is confined to a short season, the remaining por-'tion of the year being dry, and where there is a great demand 'for timber and firewood. There are practically no private forests 'left undestroyed in the Násik, Ahmednagar, Poona, Sátára and

'Sholápur Districts above the ghats, and there is a very noticeable 'absence of trees generally upon lands occupied for cultivation in 'the wide-stretching champaign country of the eastern portion of 'the Deccan, including the whole of the Sholapur Collectorate. 'On the other hand, the necessity for a very much larger supply of 'cheap fuel, and for a more general distribution of it, than is at 'present within the capabilities of the State forests in the cham-'paign country in their position and their power as now existing, 'in order to lessen the consumption of cowdung as fuel, and to 'permit of its more extended use for manuring fields of cultiva-'tion is a question of the highest importance in the interests of agri-'culture. Moreover the influence on the climate of an extensive 'growth of trees for lowering the temperature and overcoming 'aridity, and for affording protection against winds and sun on the 'plains, is of equally great importance in the interests of the food 'supply for man and beast. The larger proportion of the forests 'in the champaign country of the Eastern Deccan contains very 'poor and hard soil: these lands had been entirely divested of all 'ligneous vegetation before they were placed under forest conser-'vancy management, and it will take many years for firewood to 'be produced on them in such volume as to give an appreciable 'annual yield for the feeding of local supply. But the difficulty 'of obtaining more land possessing such good soil as is necessary 'for a quick growth of trees, and an early production of timber in 'these parts is seemingly insuperable; for it lies in the dearth of 'any suitable waste land, the property of Government; in the 'growth of population with a concurrently increasing demand for 'lands of good soil for purposes of cultivation; and in the heavy 'cost of acquisition of occupied lands, if acquisition were other-'wise practicable. The forests on poor soil which may be taken at 'three-fifths of the forest areas of the Eastern Tálukás cover uplands, 'watersheds and hill slopes; and have in addition to supplying 'pasturage to the cattle of the country, important mechanical 'functions to perform; and they even now, when their reboise-'ment is a long way off completion, arrest in a large measure the 'off-flow of the rain water which falls upon them, storing it for 'a more gradual distribution in natural course: and they work, 'though still very imperfectly, as high level reservoirs for the 'natural irrigation of the country."

From Sind it is reported that while 6,681 acres were lost by river erosion, 11,803 acres were gained, and on this and the much-vexed question of bunds, Mr. Ryan says:—

"The areas gained will not be useful for probably eight or 'ten years, while the area eroded consists in many instances of good 'old established forests and this unfair exchange is likely to con-'tinue for a number of years, owing to the results of the bund 'system; and this is said, without in the least degree wishing to

'cast any reflection on the officers of the Public Works Depart-
'ment, who, in their present policy, are actuated, no doubt, by
'what is considered in their opinion best in the interests of
'the State. But from observations made from time to time all
'along both banks of the Indus it seems that to the erection of
'bunds closely hemming in the lateral overflow of the river
'in many places must be attributed in a great measure the
'extensive erosion of canopied forests that is annually taking place.
'Before the advent of bunds the natural course of things was for
'high canopied forests to form, and for the lands on both banks
'to get gradually more and more firm. The tendency of the
'stream now is to undo all this. The Bangar lands in the Punjab
'are strong evidence of the fact, how even unforested alluvial
'banks last and become perfectly firm under natural conditions.
'Judging from results in Sind, all the old forests are vanishing
'and are being replaced by new kachas, which, owing to the
'rapid play the river has from bank to bank never last very long.
'Embankments, therefore, according to observation seem to pro-
'voke erosion: but this is not mentioned as an argument to
'abolish embankments; from a politic and economic point of view
'and for the general health and prosperty of the Province
'they are in many places an absolute necessity. The extensive
'erosion, however, which takes place might, it is thought, be to
'a certain degree mitigated were they thrown further back."

The Commissioner in Sind has, during the year, ordered that no kacha land thrown up in front of and adjoining a forest should be given except to the Forest Department, and the Deputy Conservator remarks that this is in accordance with the opinion expressed by Mr. Baden-Powell in the 'Indian Forester'.

In all circles, efforts are being made to get Working Plans started, and apparently this is being done with a very inadequate establishment. For it would seem that in the Northern Circle, what the Deputy Conservator calls the "Paper Working Plan" has only been so far carried out that of 11,360 coupes to be done, 1958 were marked off and 1,532 exploited. On the subject of these Bombay Working Plans, the Central Circle Conservator gives us an account of what is being done, which though rather long, we venture to reproduce, as likely to interest our readers in other Provinces.

"No elaborate working plans involving detailed enumeration
'surveys with the classification of trees, the calculation and deter-
'mination of an annual yield in timber based on averages, which
'may turn out to be more or less approximate when put to the test
'of actual working, and on other mathematical theories of For-
'estry which may not come off under the touchstone of experience,
'have been attempted. But rough and ready projects are being drawn
'up for bringing the whole forest region of every division under sys-
'matic treatment, for its improvement, and at the same time to

'provide for meeting the demands of local supply as far as it is 'possible to do so, with due regard to a sustained yield, and to the 'maintenance and improvement of the factors of the localities. 'A system of numerous small forest blocks in a country such as the 'Central Circle is seemingly the best calculated to satisfy, in the 'greatest degree attainable, all that can be reasonably expected and 'required of the forest management. A large number of forest 'blocks with one compartment in each, which is treated for the 'exploitation of timber and other produce, and for natural combin-'ed with artificial reproduction, furnishes many centres for the 'employment of unskilled village labour, and the utilisation of 'village transport for the conveyance of timber and other forest 'produce to their destinations when removed from the coupes. In 'every Deccan village there are carts and bullocks and when the 'latter are not employed in agriculture their owners are very glad 'to secure their employment in traffic ; and many coupes also pro-'vide as many centres for a much more general distribution of 'timber and other forest produce over the face of a district than 'could be secured by a few fellings of larger individual spread, 'but located at considerable distances apart. The working plans are 'based entirely on area, for it is not possible to foresee the future 'of the forests, such as they are, from their present condition and 'their past history. Briefly then the forests of every range which 'corresponds with a revenue sub-division, are being differentiated 'into as many small forest blocks as local circumstances and exist-'ing conditions may require ; each of these forest blocks is con-'sidered to be a separate unit of working, and it is sub-divided 'into 40 working compartments, to be exploited in turn, if there 'is anything to fell and remove, and to be treated for regeneration 'alone during the first revolution, if there is nothing to fell and 'carry out. Cultural rules are prescribed for regulating the 'extent of the felling, and the selection of trees to be reserved 'within the compartment which is to become the coupe of the year, 'because in making fellings the nature of the soil, the climate, 'species, and even individual trees require to be considered in 'guiding the axe. The following are the rules in observance for 'the deciduous forests in which the teak tree predominates :—

'(A). Quality of standard :

'*1st.*—Trees to be marked in reserve should, if possible, not 'be less than 18 inches girth at breast-height ; but may be of any 'greater size, provided they are healthy and likely to live through 'the rotation.

"*2nd.*—Seedling trees are to be preferred as standards ; other-'wise coppice shoots from a small stool, straight, clean-stemmed, 'and with a strong leader should be chosen. If really promising 'young trees cannot be found, then the healthiest trees, those most 'likely to produce good seed, must be marked.

'3*rd*.—As much as possible trees of various kinds should be 'reserved, but the most valuable kinds should be preferred.

'4*th*.—If the existing crop is nearly pure teak, special care 'must be taken to reserve other kinds, even if good trees cannot 'be found: similarly, if teak is very scarce, even inferior teak 'trees should be reserved.

'5*th*.—The quality of the trees to be reserved must be care-'fully considered; but on steep slopes, tops of hills, ridges, &c., 'whatever is available must be reserved.

'6*th*.—Fruit trees, such as mango, mhowra, toddy-trees, tem-'burni and apta trees, if sound and flourishing, should, as a rule, 'be reserved.

'7*th*.—Very inferior kinds of trees which have no value as 'timber and very little as firewood should be kept as standards 'only when other kinds of trees are obtainable.

'(B). Number and Distribution of Standards:

'8*th*.—All promising young trees of any valuable kinds under '12" girth at breast-height shall be preserved, and shall not be 'felled.

9*th*.—On flat, undulating, or gently sloping ground an average 'of 15 trees to the acre to be reserved.

'10*th*.—On steep slopes up which a man can walk without 'much difficulty, an average of 20 trees to the acre.

'11*th*.—On very steep slopes where a man must climb rather 'than walk, an average of 30 trees to the acre.

'12*th*.—Crests of hills, ridges, precipitous upper slopes require 'protection, and all trees suitable for reservation should be kept.

'13*th*.—Heads or commencements of water-courses require 'protection, and standards of all kinds should be reserved in clusters 'or groups in such places.

14*th*.—Along banks of rivers or large nálás, trees should be 'freely reserved up to a distance of about 20 yards from the edge 'of the bank.

'15*th*.—Blanks within a coupe require special attention; all 'trees, however poor, within them must be preserved, as well as 'a fringe all round.

'The suitability of the system to the trees to be found in the 'forests is one of the main points to be attended to, and in fixing 'the revolution at 40 years, as has been adopted generally for all 'the forests, due provision has been made for allowing a fair period 'of life-time to trees of all kinds in the forests. In Forestry, trees, 'as a rule, are felled before they have reached the natural end of 'their life. In the case of river side bábool reserves in the Deccan, 'experience has shown that a tree attains a girth of 4 feet 'in about 40 years, and after this the tree begins to become 'unsound internally: therefore the bábool tree is subjected 'to a system of clear cutting, and the ground cleared is treated 'for artificial regeneration; or in other words, at the end

'of the rotation the wood is cleared off the area and the 'process of creation is recommended. In the mixed and deciduous 'forests where the teak trees predominate, such trees as promise 'to outlive the rotation, or another period of 40 years, are 'reserved and are not felled; and thus a life-time of 80, 120, 160, 'or 200 years even may be given to an individual teak or other 'long-lived species under a treatment of the selection of the fittest at 'the time when the revolution brings a compartment to become the 'coupe of the year. In the region of heavy rainfall where the 'forests are evergreen, only trees that are being suppressed, and 'those that have no future are removed, here the weight of rain-'water that falls on the ground is excessive, and its eroding potenti-'ality in descending steep hill slopes is a danger to be guarded 'against. A rotation of 40 years for a forest block gives a con-'venient arrangement for working the opening and closure of 'of forests for grazing."

In these Reports there is a great deal of information regarding the growth of trees and of their marketable uses and value. The Central Circle Report gives an account of the value of the 'babul' tree in the Deccan which shews that it is quite the most important tree in that part of India, whether as giving timber, fuel, gum, tanning material, fencing or fodder, and he explains that coupes of babul occasionally fetch as much as Rs. 60 per acre. Among other trees of value he mentions the 'Nim' which, as we have ourselves seen everywhere in the Madras Deccan country, as well as in the Carnatic, is one of the most valuable trees for restocking barren areas. From the Southern Circle it is reported that teak comes up excellently from seed in Kanara and can force its way even through thick bamboo cover, a piece of observation which will probably astonish some of our Burmese readers. The Sind Report discourses on the growth of babul, poplar and kandi or jhand and we think it best to extract a few of Mr. Ryan's remarks, which, though not very new, may be interesting. We were unaware that the Sind poplar could not be reproduced from cuttings like the poplars of Europe :—

"Babul *(Acacia arabica)* is found growing gregariously in 'only a part of one forest in Upper Sind. In Central and Lower 'Sind there are unmixed canopied babul forests on the river side 'with trees of 6 and 8 feet girth, all formed by natural means be-'fore the bunds as at present constituted existed. All that is done 'now when exploiting these areas is to fence them immediately 'after being cleared, and after the inundation a dense crop of 'seedlings covers the ground without any artificial aid. These 'seeds are distributed by wind, flood and animals. By protecting 'the area from the depredations, especially of goats and camels, in '8 or 10 seasons the crop is ready for exploitation again, and pro-'bably 500 cubic feet of saleable wood per acre is available 'from it. Measurements taken of babul in the Province

'show that, in little less than five years, this tree under 'favourable conditions of soil and moisture attains a girth 'of 1½ feet at 4 feet from the ground. In no other part of 'India probably are such favourable conditions apparent, and it is 'mainly because of these satisfactory conditions that the Sind for- 'ests are probably the most valuable in India. It might seem, 'therefore, that sylviculture is rendered very easy under such cir- 'cumstances but the fact is, that the country is infested with large 'flocks of goats and hundreds of camels, and the greatest difficulty 'possible is experienced in protecting the fenced-in areas although 'large hedges 6 to 8 feet high are constructed to exclude the 'animals. The babul in consequence of the tremendous spur owing 'to favourable conditions of soil and moisture, would, no doubt, still 'grow if left unprotected, but it would remain in the form of a 'scrub, and very few plants would probably go beyond that stage. 'Fortunately in the fresh alluvial lands, goats and camels do not, 'as a rule, penetrate to a very large extent; camels are afraid to 'go because of their liability to sink in the "gup" or soft mud 'of which the kacha land consists. They restrict themselves 'chiefly to the forests of older formation, and in consequence of 'this, on the new kacha lands, young babul may be seen forcing 'itself up ultimately to form canopied forests if not eroded by 'the river.

'Baban or poplar, (*Populus euphratica*) which commands a 'very good price in the market, in spite of its crooked bole, is entire- 'ly grown under natural conditions. In several localities in Upper 'and Central Sind it grows abundantly on the fresh alluvial for- 'mations, and in less than a dozen years suitable poles for dwell- 'ings are available, the value of which is Rs. 30 to Rs. 40 per 100. 'Attempts to reproduce the tree artificially from seed have been 'tried in the more permanent lands but without success, and such 'attempts, it is thought, will never be fruitful because the seed is 'extremely light and delicate, and like thistle-down and willow- 'wool is carried away in the breeze, and is only capable of germi- 'nation in localities where the soil is of extremely soft consistency. 'Attempts to reproduce the tree from cuttings have also been 'tried, but without success. All that can be done is to fence in 'the areas self-clothed with young poplar, when the soil has suffi- 'ciently stiffened, and to protect seedlings from the depredations 'of buffaloes, bullocks and cows, who are very fond of the new 'and succulent young poplar leaves. To the damage caused to 'the poplar in its early stages by these animals, may possibly be 'ascribed its present crooked growth; but the tree being a very 'shallow rooted one and growing in localities exposed to the full 'force of the breeze, it is more than probable that the swaying 'about, to which it is subjected induces a sinuous growth. Per- 'fectly straight poplar poles and rafters are rarely, if ever, found. 'The tree coppices readily, and from the roots, which spread out

'laterally and run just below the surface, a heavy crop of young 'poplar springs up. After a fire in the Azizpur Forest, in the 'Sukkur Division, in an area where there were several mature 'poplar trees, young poplar was found freely springing from the 'roots at 30 feet from the parent tree. It flourishes along the 'Indus as far down near its mouth as Kot Almo, a reserved forest, 'a few miles north of Tatta in the Shahbunder District. The rail-'way have tried it as fuel and rejected it; and the only use it is 'put to is for timber.

'Kandi (*Prosopis spicigera*) is found growing away from 'localities subjected to heavy inundation. It possesses great 'vitality, grows rapidily, and coppices with astounding rapidity 'where the stools are not entirety submerged by flood. In any 'felling operations, therefore, which are undertaken care has to be 'exercised not to cut the stools low down otherwise after-results 'are *nil*. On being fully established the tree can exist without 'surface irrigation and will coppice freely although it is doubtful 'whether under such circumstances it will survive a second felling. 'The roots of this plant enter very deep in the sub-soil, and there 'is one instance recorded by Sir D. Brandis, where the root pene-'trted upwards of 70 feet. In view of this characteristic it would 'possibly be a better tree to plant along the base of bunds than 'babul which is a very a shallow rooted plant and easily uprooted 'by wind and flood."

On the subject of produce there is nothing to add to the notes which we made last year, except to notice that Mr. Ryan adds himself the number of persons who have so often advocated the development of the trade in the fibre of the 'ak' plant, *Calotropis gigantea*.

Last year, we drew attention to two very interesting points about the work in the Bombay Presidency, and we find both of them very prominently mentioned in the reports, now before as. One is the very extensive use made of the Forest Guards in various works, sowing seeds, planting, cutting tamarisk on forest rides in Sind, eradicating cactus, and what not; and the other is the large area covered by works of artificial reproduction in the Central Circle, where it seems that 19,876 acres were treated under regular planting or cultural operations at a cost of Rs. 9,145 or only a little more than As. 8 per acre. Mr. Shuttleworth remarks:—

"The cultural operations undertaken by the forest guards 'as a part of their ordinary duties, cannot fail to promote the 're-wooding of the country. All the forest region of the Circle 'is parcelled out into beats, not an acre of land in forests is left 'outside of a beat, and each beat is an unit of seed collecting and 'of sowings, *i.e.*, of artificial cultural operations by forest guards. 'So that re-creation, the chief work of forest management in the 'Deccan, goes on yearly, to a limited extent it may be, in 1,094

'beats in the Central Circle, without any extra cost to Government."

We have always read the accounts the work done by Forest Guards in Bombay with envy, but were puzzled to understand how they did their other work. However, we now perceive that each Forest Guard has only an average beat of about 5½ square miles which is,of course, a much smaller area than is usual in most other Provinces.

The favourable reviews by the Commissioners and especially that by the Commissioner in Sind, which shews great personal interest in the forests and knowledge of forest work, are very noticeable this year and the sympathetic tone of their remarks and of the Government review is a great improvement on the strong adverse criticism of a few years ago. In the Government review, the chief noticeable point is the recommendation of fencing. They say :—

"It is observed with regret that except in Sind, comparatively 'little was done in the year under review in the matter of fencing. 'The Governor in Council regards it as of great importance that 'such closed areas as adjoin grazing grounds should be fenced 'as soon as funds are available. If there is nothing to prevent 'trespass except the occasional visit of a guard who may have 'several villages to look after, trespass is sure to be general. 'The proportion of offenders who are detected must be minute, and 'if the chance of detection is small, the punishment in any form 'of the few who are detected can have little or no deterrent effect. 'Where there is a visible obstruction to trespass either of cattle 'or of people for the purpose of taking forest produce, it is not 'likely to be removed, and in such case offenders can have no 'sympathy from law-abiding people on the ground of ignorance 'of what is prohibited."

We are strong advocates of fencing of some kind wherever it is practicable, but in many places where the forests are extensive and the length of boundary great and perhaps interrupted by ravines which cannot be fenced across, or paths which must be left open, fencing is often nearly prohibitive if only from its cost, and in such cases surely a broad well-kept boundary line with good marks should be ample as a warning against trespassers, or else why were Reserved Forests specially placed in the Forest Act on the same footing as public plantations are under the Cattle Trespass Act.

The financial results of the forest year were—

Receipts,	...	... Rs. 37,85,691
Expenditure	...	... „ 20,97,027
Surplus	...	... „ 16,88,664

We can now conclude with one more short extract to show that even in a serious Government Report an Officer may occasionally be allowed his little joke.

"Large timber is a necessity in India. and the forests in the 'wilder parts of the country can be devoted to its production; 'and there the more vigilant forest guards, at all times active and 'keen and ruthless in protecting the natural reproduction against 'destruction from trespassing cattle, are *Felis tigris*, *Felis pardus*, '*Felis jubata*, and *Cuon rutilans*."

The *Baluchistan* Report is chiefly interesting on account of the discussion on the questions of the area of forests to be adopted for reservation and the financial prospects of the Shebo Plantation. From Mr. Reuther's Report it would appear that this plantation was started in 1889 and that there are now 2,682 acres completed. The cost of the plantation up to date has been Rs. 100,737, (which after all, is only, Rs. 37-8 per acre, not so very large a sum for plantations in a difficult country) and the future expected yearly expenditure is Rs. 13,000 for the next 5 to 10 years. So far, the revenue, chiefly from crops grown on the land to break it up, has been Rs. 10,346 and the Divisional Officer, the Agent, and the Government of India seems to have become rather frightened, the Government of India going so far as to "regret that owing to 'slackness of supervision public money has been 'unprofitably 'spent." Of course, being ignorant of the locality and of the state of the plantation, we are not quite competent to judge, but we venture to think that matters may not be so bad as they would seem. One cannot make plantations without expenditure and we doubt whether some of those which we are accustomed to point to as great successes (*e.g.* Nilambur) have cost very much less, especially if debited with the pay of the supervising officers. Then, too, one cannot expect a plantation to begin to pay straight off, especially in a dry climate, and it may be that the Shebo plantation when once it begins to come into working, will very soon pay off the capital expended on it. Mr. Reuther says "ultimate success 'may be confidently expected, though at a very high cost, and re-'garded as a merely financial investment, ultimate profit cannot 'as yet be predicted." Assuming that in 10 years time there will be 3,000 acres fully started and beginning to give some yield and no longer requiring irrigation, the cost will have been Rs. 1,00,737 + Rs. 13,000 × 10 = Rs. 230,737 or about Rs. 77 per acre. The expenditure can probably then be reduced very greatly and working begin. Assuming Rs. 6,000 as the yearly expenditure, the gross revenue will have to be 13,000 Rs. in order to give 3 per cent interest on the Capital (Rs. 7,000). This amount will probably not be obtained at once, but ought not to be difficult to get after a few years. A well started and flourishing plantation of 3,000 acres of good trees ought to be a very paying property in the end in such a country as Baluchistan.

Turning to the question of the area to be permanently reserved, Mr. Reuther's account of what has been done and what might be done, were certain difficulties removed, is so interesting that we propose to quote it.

"The Ziarat juniper tract, is the only extensive forest region 'in Baluchistan. But outlying and scattered patches of juniper, 'pistachio, olive, sissoo, etc., as well as several tracts of 'scrub-jungle in the Sibi plain, have already been reserved to an 'aggregate extent of 115 square miles. So far as professional 'forest exploration of the country has as yet extended, no further 'outlying tracts have been found fit to be specifically recommend-'ed for constitution as State Forest, excepting those mentioned 'below, aggregating 77 square miles. Whether more extended 'and minute examination of the country generally will justify 'proposals for reservation of other areas is problematical, but the 'probability is that such areas will not prove to be of any impor-'tant extent, excepting possibly in the Zhob District which is 'beyond the scope of the present considerations, partly because 'the Zhob District has as yet been only cursorily explored profes-'sionally, and because all forest management in Zhob has for the 'present been assigned exclusively to the District authorities.

'The present situation is more clearly illustrated by the fol-'lowing tabular summary.

AREA, IN SQUARE MILES, AVAILABLE FOR STATE FOREST.

CHARACTER.	Already reserved.	Specifically proposed for reservation.	Physically suitable for reservation.	Prospective maximum of available area.	REMARKS
'Ziarat juniper zone ...	18	25	35	78	137 square miles in the Ziarat juniper zone are not fit for reservation.
'Outlying tracts in which juniper predominates ...	51	17	Indeterminate; but inextensive.	68	
'Mixed forest in the hill-ranges ash, olive, pistachio, tamarisk, etc. ...	24	35	Ditto ...	59	This area of 59 square miles contains a little juniper here and there.
'Mixed scrub-jungle in the plains (Sibi)...	35	...	...	35	
'Irrigable land suitable for artificial plantation ...	5	0·6	Ditto ...	5·6	
TOTAL. ...	133	77.6	35	246	

'It is evident from the foregoing statement that the main 'hope of any valuable extension of the area of State Forest in 'Baluchistan (excluding Zhob) still centres in the prospect of 'further reservation in the Ziarat juniper tract. As long ago as '1889 a committee composed of the Political Agent Thal-Chotiali, 'the Forest Officer, and two native members of the Political Staff, 'considered the question and submitted a report to Government 'showing that out of the whole area physically suitable for 'reservation, at that time computed at 67 square miles, only 18 'square miles (including 6 square miles previously reserved) 'could be immediately secured for constitution as State forest, and 'this area of 18 square miles has actually been reserved as the 'direct result of the recommendations of the committee. But 'reservation of a more extensive area was found by the committee 'to be impracticable and impolitic, as involving undue restriction 'of pasture-rights hitherto exercised without restraint by some '1,245 families, owning upwards of 60,000 sheep and about 2,000 'cows and other cattle, who for five to seven months each year 'habitually live within, or near, the juniper forests.

"The committee, however, declared that whenever it should be 'found possible to throw any of the State Forests open to grazing, 'additional areas might be reserved. As, however, in the very 'poor condition of the forest and the peculiarly adverse climatic conditions of the country, improvement and regeneration cannot 'be ensured without complete exclusion of sheep, goats, and camels 'for a period the duration of which must be regarded as practical-'ly unlimited, this declaration by the committee affords no tangible 'prospect of any possible extension of the area to be reserved as 'State Forest and as a matter of fact no additional area (beyond 'the 18 square miles selected by the committee in 1889) has yet 'been secured in the Ziarat juniper tract.

'The considerations which at that time curtailed the area of 'the proposed Ziarat State Forest have remained in force ever 'since, and constitute essentially a question of State policy, in the 'settlement of which the Forest Department can have no leading 'voice. Whether, however, sufficient pasturage can be found for 'the 60,000 sheep and goats in the 137 square miles of sparsely-'wooded juniper tract permanently excluded from the proposals of 'the Forest Department, and in the large areas available outside 'the juniper region, a question which, in view of the paramount 'influence on Forest conservancy in Baluchistan, might well be 'made the subject of further invesigation.

'But in the event of finality of the decision that the extensive 'flocks afore-mentioned cannot be wholly excluded even from the 'limited area proposed for reservation, it will be worthy of consider-'ation whether the proposed reservation should out be carried out 'nevertheless (to the full extent of the remaining area of 60 'square milies of promising juniper forest), and the exercise of

'certain defined and limited pasture rights admitted under proper 'regulation.

'In addition to the objections based on the pastoral interests 'of the nomad shepherd population, financial considerations have 'also contributed to hinder more rapid expansion of the area of 'permanent forest estates. The present impossibility of working 'the forests profitably has been repeatedly urged as a reason for 'withholding consent of further reservation; but such an objec- 'tion need not be too hardly pressed; for though the existing con- 'ditions of forest conservancy in Baluchistan preclude the possibil- 'ity of immediate profit, the value of the State Forests, even from 'a purely pecuniary point of view, will increase from year to year; 'and it cannot be doubted that ultimately they will more than 'repay the cost of protection. And their importance in the gene- 'ral economy of the country; their influence on the permanency 'of local water-supplies; their value in the event of extended 'military operations; and many other points in favour of their 'careful preservation and improvement may well be held to coun- 'terbalance, and indeed far outweigh, all objections on the ground 'of present want of direct pecuniary profit. It may also be urged 'that continued delay in effecting the proposed reservation will 'not only accentuate existing difficulties, owing to growth of pres- 'criptive rights, etc., but also must entail rapid diminution in the 'value of the forest tracts themselves."

Mr. Reuther is to be congratulated on having put the matter so clearly and it is very satisfactory that the agent, Sir James Browne, "concurs generally in the views expressed by the Deputy 'Conservator in this important matter." while the Government of India remark on them as follows :—

"So far the question of reservation has been simplified by 'the fact that the areas reserved have been almost free from 'rights of user. It appears, from Mr. Reuther's report, that the 'area suitable for forests of which this can be said has been prac- 'tically exhausted, and that in bringing any further area under 'forest control, it will be necessary to provide for extensive rights 'of user. If it should be decided that, notwithstanding these 'rights, it is advisable to bring further portions of the Ziarat 'juniper tract under the forest law, the needs of the local popula- 'tion should be amply provided for on the lines laid down in 'Resolution No. 22-F., dated 19th October, 1894."

The remarks on 'Natural reproduction' are always likely to be intersting from such a country. This year it is pointed out how and why juniper seedlings of less than four years of age are so scarce, the last seed year was 1890-91, but the seedlings which then appeared were largely destroyed by locusts. *Prunus eburnea* seems to be the species from which most is to be expected as a fuel-wood.

The financial results of the year were :—

	Revenue	Expenditure	Deficit
Forest year ...	21,395	63,829	42,434
Financial year ...	20,731	63,728	42,997

Of course the Baluchistan forests cannot be expected to pay for a a long time to come.

The *Burma* Report shews that there were 9,642 square miles of Reserved Forest and 709 square miles of taungya area under the Department at the close of the year, giving 6 per cent only of the area of the Province, an area which seems to us to be rather small for a country like Burma, possesing huge forests of very great economic value in the present, and greater prospects still in the future. It is noticeable that the Government of India admit, in regard to Burma, that their Circular Resolution No. 22 of October, 1894, necessitates no change of policy in Burma. It seems to us that a good many Provinces are in the same way and that the Resolution would have caused less disturbance if it had been written for the Provinces to which it does apply, instead of being made general, necessitating great waste of time and labour in reporting on it.

The Tenasserim Circle Report records that the extraction of teak was in excess of that contemplated, and that the extraction of woods other then teak was less than was intended. The gross outturn of the Circle was :—

	Tons	Value, Rs.
Teak	16,565	2,75,828
Other reserved woods ...	8,870	72,398
Unreserved woods ..	24,253	40,392
Fuel	24,623	9,707
Bamboos	...	4,615
Canes	...	4,397
Minor produce ...	...	8,450

The Report of the Pegu Circle says that only teak trees which have died naturally or trees of large size are extracted, and discusses the question of reproduction in a paragraph from which we extract the following :—

"A further question presents itself—Is reproduction keeping 'pace with exploitation? Of late years over 1,200 acres have 'been planted annually, and if these areas were fully stocked, a 'final yield of 70 tons per acre or 84,000 tons in all might be ex- 'pected ; they are not fully stocked, but an outturn of 56,000 tons 'may reasonably be expected from 1,200 acres of taungya planta- 'tions of average density. As regards natural reproduction, it is 'believed that in dry forests it is at least keeping pace with 'exploitation, and that in moist forest it is an uncertain quantity ; the 'area of dry forest is certainly not less than 1,000 square miles, on

'which it may be assumed that natural reproduction is at least pro-'portional to an exploitation of 6,000 tons. It may further be assum-'ed that the removal of climbers and useless trees which is in 'progress in three divisions must to a certain extent encourage 'natural reproduction. It may be safely assumed therefore that 'reproduction is keeping pace with exploitation, but it is doubtful 'whether the former is much in advance of the latter. The Forest 'Department cannot remain content with an outturn of 6·6 tons 'only per square mile, and a much larger expenditure on repro-'duction, fire-protection and establishment seems advisable."

We are surprised that no mention is made of the possibility of getting a bamboo-seeding year and utilizing it fully for the reproduction of teak. We have heard otherwise that somewhere about 1893 or 1894 the 'Kyathaungwa' (*Bambusa polymorpha*) *did* seed in parts of the Pegu Circle but that no advantage was taken of the circumstance; but the present report only mentions that enquiries go to shew that it last flowered about 40 years ago both in the Arakan and Pegu Yomas. (Sir D. Brandis collected flowers in 1862 and Mr. S. Kurz in 1871). It is rather sad to hear that there was a plentiful reproduction of cutch but that most of the seedlings did not survive the first forest fire. The gross outturn of the Circle was :—

	Tons	Value, Rs.
Teak	52,933	19,90,706
Pynkado	23,336	121,947
Reserved woods ...	3,940	28,213
Unreserved woods ...	57,050	77,099
Fuel	94,732	41,666
Bamboos	...	43,714
Canes	...	12,330
Minor produce		25,004

The following account of the teak market of the year will be read with interest.

"The teak market in Europe has been steady almost through-'out the period under review, the year closing at the rates quoted 'in the opening, namely, £9 to £10 for cargo timber and £9 to '£10 10s. for Europe planks of usual market specification.

'There was an upward tendency late in 1893 in consequence 'of the annual purchases for the British Navy, but they failed to 'establish any permanent improvement, the demand for general 'ship-building being limited and railway requirements unusually 'restricted.

'The Continent and so-called "outports" have again absorbed 'quite 33 per cent. of the shipments to Europe, France taking off 'the usual quantity chiefly for naval purposes, whilst Germany, 'Italy, Russia, &c., continued to work off moderate quantities in 'the same direction. Endeavours to place teak in the United 'States, America, have not met with success.

'Free supplies from Siam have resulted in very considerable 'shipments from Bangkok to Europe, and, although the price of 'Bangkok wood in the Home markets declined to only about £8, 'there are no signs of any diminution in Bangkok charters, and 'the competition of Bangkok wood is beginning to be felt severely 'by Burma shippers. The arrivals in Bangkok during the last 'floating season amount to uearly 65,000 logs against 72,000 logs 'in the preceding season."

In the Eastern Circle, Upper Burma, the gross outturn was:—

	Tons	Value, Rs.
Teak	152,121	13,41,100
Reserved woods ...	264	6,086
Unreserved woods ...	34,213	61,394
Fuel	79,392	39,893
Bamboos ...	...	29,062
Canes	...	2,775
Minor produce ...	...	1,66,895

We are interested to see that the tapping of *Pinus Kasya* for resin was attempted in the Southern Shan States with the result that 275 tons gave 374 viss of resin (17 maunds) at a cost of Rs. 224. The resin has been sent to England for trial, and we hope it will be approved, at the same time the cost of extraction must be greatly decreased, we are sure, if it is to be a profitable business, for even at the rather fancy rate of Rs. 7 per maund, such an experiment would have given a deficit of Rs. 105. We expect that the local market is the best thing to aim at, as there must be considerable demand for turpentine in Rangoon.

The notes on natural reproduction for the Eastern Circle record the flowering of the 'Myinwa' bamboo (*Dendrocalamus strictus*), of the 'Wapyuzan' (*Bambusa Oliveriana)* a new species, and of the 'thanawa' (*Thyrsostachys Oliveri*). The following account of reproduction in the Southern Shan States is interesting.

"The majority of the teak forests in the Southern Shan States 'consists of belts lying along the steep banks of narrow valleys 'below the *In* forest, which cover the hills and above the evergreen 'growth on the banks of the streams. In such forests the number 'of different species is large and the usual bamboo is myinwa. 'The reproduction is generally sufficiently good in spite of the 'steepness and rocky character of the ground. The myinwa flowers 'sporadically every year. In more open situations thanawa covers 'the ground and with teak forms the principal stock. This Bam-'boo flowers at long intervals and, though its cover is light, it 'takes entire possession of the soil, preventing the reproduction of 'teak. There are large areas of this class of forest, which it will 'be interesting to watch when the thanawa's time for flowering 'comes round. In the few places in which teak forest has an 'opportunity of spreading out over level ground, the stock of 'seedlings is generally sufficient in spite of annual fires. Old

'taungya clearings are often filled with young teak, which also 'establish themselves with great vigour on low lying alluvial 'ground in spite of severe fires."

The Western Circle Report gives the gross outturn as follows :—

	Tons	Value, Rs.
Teak	53,669	5,01,280
Reserved woods	54	996
Unreserved woods	8,853	11,481
Fuel	8,338	3,064
Bamboos	...	20,588
Canes	...	4,700
Minor produce	...	1,12,646

The total financial results for Burma as a whole were :—

	Forest year.	*Financial year.*
Revenue ...	58,25,093	57,85,100
Expenditure ...	18,17,655	18,62,510
Surplus ...	40,07,438	39,22,590

A fine result, but what strikes us most about it is that with such results in the way of surplus revenue, surely greater success in, and the extension over larger areas of, fire protection, ought to be attained and much more money be spent on opening out communications, and in works of improvement. We can add that the total of the figures we have given for the circles, gives an outturn of 275,288 tons of teak 36,464 tons of reserved wood, 124,369 tons of unreserved woods, and 207,085 tons of fuel, the ton being, we presume, the nominal one of 50 c. ft. Besides this timber, bamboos were sold to the value of Rs. 97,979, canes to the value of Rs. 24,202, and minor produce, which includes cutch, to the value of Rs. 312,994. Such figures show conclusively the value of our forest estate in Burma and suggest that it must not be starved either in Officers or in funds and that, as before suggested, the area of reservation seems to require increase.

VI.—EXTRACTS, NOTES AND QUERIES.

Oil of Turpentine.

Owing to the comparatively low value of petroleum, shale naphtha, and rosin spirit, these liquids are frequently used to adulterate the more valuable body-turpentine. Indeed, enormous quantities of so-called turpentine have recently been on the market which have contained large quantities of one or other

of these adulterants, and it is of the highest importance that the methods of examining this product should yield reliable results. In addition to the really adulterated turpentine in the market there are many so-called turpentine substitutes, sold under such fancy names as "turpenteen", which consist in the main of the bodies I have mentioned above. There are always many difficulties in examining turpentine, since there are several varieties of it which possess essentially different properties. The chief of these are French, English, or American, and Russian. The optical actinity used to be regarded as a very definite test, as turpentine rotates the plane of polarisation, whilst none of its adulterants usually do so. The amount of rotation being fairly constant, any reduction was looked upon as indicating adulteration. But since French turpentine rotates the plane to the left and American and Russian to the right, it is clear that mixtures of these varieties might give natural results without the addition of any adulterant. The specific gravity, too, was once thought valuable, but in reality this will only indicate adulteration with petroleum spirit as the following figures show :—

Turpentine	...	·558 to ·878
Coal-tar Naphtha	...	·860 to ·875
Rosin spirit	...	·856 to ·880
Petroleum Naphtha	...	·700 to ·750

The flash-point is also valuable in showing any adulteration with ordinary petroleum naphtha. I have always found that in genuine samples this variety (taken by the official test in Abel's apparatus) from 92 degrees Fahr. to 98 degrees Fahr. The addition of 5 per cent of petroleum naphtha will lower this figure very considerably.

The residue, after drying on the water bath, does not exceed one per cent in the best samples, although in old samples it rises considerably. By far the most useful test, however, is the behaviour on distillation.

With petroleum spirit or rosin spirit the initial temperature of distillation varies greatly with the quality of the spirit and the temperature rises gradually without allowing any large quantity to come over at any specific temperature, with both of these adulterants a variable proportion of residue of very high boiling point is usually left in the still. The statements in most of the usual text books as to the behaviour of pure turpentine are by no means uniform, and I have obtained several samples of undoubted authenticity and examined them in this respect. The results are tabulated below, and may be relied upon as representing genuine samples :—

The Chief point of note is that American turpentine yields a heavy proportion of its distillate below 165 deg C., whereas the Russian oil distils at a slightly higher temperature. An examination to be as complete as possible should comprise all the factors I have mentioned in this note. I will conclude by quoting the figures

obtained from a somewhat remarkable sample of so-called turpentine, obtained from a very reputable source. They are as follows :—

Specific gravity	...	...	·9317
Residue	...	...	1·78 per cent
Flash-point	...	...	98·50 Fahr
Viscosity at 60 degrees Fahr		...	14 seconds

The gravity, residue, and viscosity were so elevated that I examined it by the distillation method. It turned out to be a mixture of turpentine, camphor, and water, evidently sent out in mistake. With so valuable a commercial product I cannot too strongly emphasise the necessity of carefully examining one's samples.

		No. I American Turpentine.	No. II. Russian Turpentine.	No. III. American Turpentine.	No. IV. American Turpentine.
Specific gravity	...	·8768	·8717	858	·867
Flash-point	...	95° Fahr	98° Fahr	39° · Fahr	95° Fahr
Viscosity (Redwood) at 60 degree	...	27 seconds	26 seconds	...	26 seconds
Residue 100 degree C	...	1·6%	1·75%	...	0·62%
Boiling-point	..	312° Fahr	320deg Fahr	309deg Fahr	312deg Fahr
Fraction below	160°	46·5%	Nil	66 per cent.	92 per cent.
	165°	35·0%	32 per cent.	66 per cent.	92 per cent.
	170°	5·0%	35 per cent.	12 per cent.	1 per cent.
	175°	1·8%	15 per cent.	6 per cent.	...

(*From "Indian Engineering"; an extract from the "Ironmonger."*

Shifting Sands.

A method of reclaiming sand wastes has been successfully carried out on the seashore of Wales, which may well be imitated by the states bordering on the Great Rajputana desert, as well as by those owning similarly situated lands in India. First, in order to reduce the force of the wind, a screen is erected, composed of a wire fencing, with twigs worked into a fascine along the wires. Behind this protecting fence or wattled wall, trenches 6 feet apart are dug and filled in with earth or loam to serve as beds for a plantation of timber trees. Between these trenches, seeds or cuttings of indigenous shrubs and grasses are placed. This forms the boundary of the waste taken up for reclamation. The land in the rear of this line is then filled up with trees and shrubs which are found to thrive luxuriantly in the neighbourhood.

In eight years time the piece of land thus treated was transformed into a well-timbered and thriving forest from an useless and unprofitable waste.

In Rajputana, "babul" may be placed in the trenches as a timber tree, whilst such shrubs as "peeloo" and tamarisk may fill up the intervening spaces as an undergrowth. The elephant or "secunder" grass may be used for the wattles and also be intermixed with the shrubs. All the above-mentioned trees, shrubs and grass have a marketable value and will not only repay the small outlay incurred but will eventually be a source of income. In Marwar, where each town is an oasis, the plan described above will enlarge the area under cultivation and in time change its climate by increasing the rainfall, so that any local undertaking of this nature will have a general and lasting effect in the country.

Managers of Railways, who are generally keen on matters affecting revenue, will do well to take advantage of a system which will supplement their earnings from grass grown on the embankments and at the same time reduce the maintenance of tracks in sandy districts.

Although artificial means have been employed to arrest sand-drifts, these are unproductive and therefore employed with reluctance whilst this system is without that drawback—(*By 'Railway Engineer' in 'Indian Engineering*).

Death of Professor Willkomm.

We see from the 'Forstlich-natur-wissenschaftliche Zeit schrift' for November 1895 that Professor Moritz Willkomm, the well-known author of the 'Forest Flora of Germany', Professor at the University of Prague and Director of the Botanic Garden at that place, died in Bohemia on August 21st last, at 75 years of age.

Dr. Grasmann.

Dr. E. Grasmann who has been for the last eight years Professor of Forestry in the University of Tokio, Japan, and who, the students of the 1st year of Coopers Hill will remember, accompanied them in 1887 on their tour in the forest of the Bavarian Alps, has given up his Japanese appointment and returned to Germany, where he has rejoined his appointment in the Bavarian State Forest Department.

The Turpentine-tree.

Botanical Name.—(*Syncarpia laurifolia*, Ten.)—Derived from two Greek words, *sun*, together, and *karpos*, a fruit, in allusion to the heads of fruits which have their calyces joined or grown together (connate).

There are two other species of *Syncarpia*, viz. :—*S. leptopetala* very closely allied to *S. laurifolia*, which is found in Northern New South Wales and Queensland, and sometimes goes under the name of "Brush Turpentine," or "Myrtle." The other species is *S. Hillii*, called, like the other two, "Turpentine" but also "Peebeen," which is the aboriginal name at Fraser's Island (of the Queensland coast) where it is found.

Flowers.—White, and in small round balls, consisting of a number of individual flowers joined together by their calyces.

Fruit.—Hard and woody, and containing abundance of the brown, dust-like seed which sheds as soon as the fruits get dry On the fruit are often seen globules of the so-called "turpentine.'

Leaves.—Somewhat laurel-like, as the specific name denotes. The underside of a dirty white, with small black patches, caused by a minute fungus.

Exudation.—If the tree be wounded, there exudes a brownish liquid resin. If it be desired to collect this substance in quantity, the best way is to fell a tree and cut it into logs, which may be inclined. The resin will exude, forming a ring between the wood and the bark, and may be scraped off or drained into a suitable vessel. It belongs to the class of bodies known as "oleo-resins." It promises to be a highly interesting body, and is being chemically examined.

Bark.—The bark is of a flaky, fibrous character, and often of considerable thickness. It is of a brown colour. In large trees it has a furrowed appearace. The bark of our turpentine-tree does not appear to be put to any useful purpose, but the Hon. W. Pettigrew states that the bark of the Peebeen (*S. Hillii*) is used by the natives of Wide Bay (Queensland) for the purpose of making canoes.

Timber.—Valuable for posts in timber fences, as it is strong and very durable underground. It is used to a limited extent in ship-building. In the Jurors' Reports, London International Exhibition of 1862, it is stated to be "the best wood for railway-sleepers." At the present day, however, is is never knowingly used for such a purpose, its tendency to warp and rend being against it.

Turpentine timber is not easy to burn, except with a good draught. In such situations as pillars, girders, &c., in buildings, it usually only chars, and consequently is easily extinguished—a very useful property in buildings. I was informed that, in a very large fire in Sydney, surprise was expressed that the building was not gutted, for the wooden girders and joists were put to a very severe test. It was believed that the girders were ironbark, and they were so specified, but the contractor substituted turpentine

without anyone being any the wiser. This pious fraud was, however, the mean of minimising the destructive effects of the fire.

Another instance of the substitution of turpentine for ironbark was not so happy. In a certain suburb some carters did a roaring trade in ironbark firewood at a rate very much below that ruling for ironbark. When the wood began to be used complaints were very general, for it would burn with difficulty. I found that the wood was turpentine, and that these enterprising carters had been clearing a turpentine paddock about 2 miles away. These incidents show that ironbark and turpentine bear some superficial resemblance, but substitution of one for the other should be detected by any careful man.

It is, perhaps, the best timber we have for piles, &c., for sea-water, as it is so resistant to the *Teredo* and other marine borers. This immunity is believed to be owing to the layer of oleo-resin between the bark and wood, which is distasteful to animal organisms, but we have no absolute experiments on this point. Turpentine piles are always driven with the bark on, as when stripped of their outer covering, they are by no means proof against the attacks of marine and other borers.

A pile was exhibited at the Colonial and Indian Exhibition of 1886, taken from a jetty at Brisbane Water, near Sydney, where it had been fully exposed to the waves of the Pacific Ocean for twelve years. It had been entirely unprotected, yet on cutting it through it was found to be perfectly free from decay, and from the attacks of the *Teredo*. I am informed that piles of this timber have been known to remain sound, even for thirty years, in sea-water. It is also very durable in fresh water.

The Hon. W. Pettigrew, a Queensland timber merchant, however, states :—"This timber was said to be capable of resisting the cobra, and thereby a great value was set on it by the Government, yet when tested by the Harbour-master at Brisbane, it has been found that such not the case, as specimens on the table will show." I give this statement of a gentleman of high reputation in colonial timbers on the principle that, advocate as I am for their use, I always draw attention to any defects I may know them to have. It is, however, so opposite to my direct personal observation, that I trust readers of the *Gazette* will come forward with their testimony in regard to the durability of the turpentine in sea-water.

It is very resistant to white ant, but it must be remembered that no timber is absolutely white-ant proof, as white ants, if put to it, will probably eat any timber on the face of the globe.

It is said to be comparatively soft and brittle, but perhaps there is some mistake in this, as I have always found it to be as hard as the average myrtaceous timbers, and it is not brittle when

the sap-wood is removed. In Professor Warren's work on Australian timbers there are a number of tests as to the strength of this timber to which I desire to refer my readers.

Like many other myrtaceous timbers, such as myrtles, turpentine is very liable to rend in drying. It also warps when much exposed, unless seasoned with unusual care; this is a drawback to its use for uprights in buildings.

Size.—From 120 to 180 feet is no uncommon height for this tree to attain. It often measures 20 to 30 feet in circumference with great length of bole, but such magnificent specimens are, within easy range of Sydney, usually found in gullies difficult of access.

Distribution.—The return gives valuable information concerning turpentine, and is a guide to the distribution of this timber. I may mention that it extends throughout the coast districts from the Tweed to the Ulladulla district, arriving at its greatest luxuriance in deep gullies containing good soil, in which situations it is found a considerable distance inland into the mountains and table-lands. The southernmost tree known at present is at the head of the Cockwhy Creek, between Ulladulla and Bateman's Bay. It is also found in Queensland. Its occurrence is usually a sign of good soil.

Propagation.—From seed, which is very freely produced. This tree is one of the best indigenous shade-trees in the Colony. It is gregarious, and its noble, leafy head makes it an ideal tree under which to put garden seats, or to serve as shelter-trees for men or animals in a paddock, or as specimen trees, to give a park-like appearance to land. It is one of those trees that should always be spared, in clearing operations, unless its room is actually wanted. It is so different in appearance to the ordinary run of gum-trees that the occurrence of turpentines is often a relief to the eye. My experience tends to show that turpentines have a large number of roots near the surface, which, if disturbed, readily kill the tree. I would not, however, like to generalise on this point. I have seen some experiments on pollarding the turpentine. The trees were cut in the month of May, and have freely sent forth leaf-buds a considerable distance down the trunk, giving the tree quite an ornamental appearance. Where a tree is growing too large, and it is not necessary to absolutely remove it, the experiment I have indicated might be made.—(*J. H. Maiden—Agricultural Notes, N. S. W.*)

Note.—(This tree is well known in the Nilgiris where it grows well and could easily be more largely propagated.)

HON. ED.

Churchill and Sim's Circular,

1st January, 1896.

East India Teak.—The importation of Timber and Planks has been—

	1889.	1890.	1891.
Importation.	19,407 Loads ...	16,000 Loads ...	16,588 Loads
And the deliveries	15,899 ,, ...	17,140 ,, ...	14,371 ,,

	1892.	1893.	1894.	1895.
Importation.	7,923 Loads	12,687 Loads	9,849 Loads	22,200 Loads
And the deliveries	10,455 ,,	12,646 ,,	10,620 ,,	18,399 ,,

The Teak trade in London has been a curious one in 1895; full of probabilities of great change which have not been realised. The greatly increased quantity of the wood which has been landed in the docks might have sent the market to the lowest depths it has seen for five years past; or the great increase in its consumption might have raised it higher than has ever been known. In the event these forces have neutralised each ether, and the market has remained immoveble at one steady level from January to December. This is not altogether satisfactory, for the level is a low one, and there have been in the past year so many causes operating all over the world in favour of this most political of woods, that the extra supply produced should have been something more than neutralised by them if the general demand had shown any elasticity. The labour troubles at the Scottish and Irish shipbuilding ports have probably checked that elasticity just at the critical moment; if they could be settled before it is too late there would be every prospect of a gradually improving market for Teak in the new year. In the matter of quality, the imports of the period under review have maintained their high reputation, and some of the best wood now in the docks has come from Siam. The figures of the year's trade have been largely swelled on both sides by Navy requirements brought here for approval and and selection before delivery to the Dockyards.

Satinwood.—East India.—There was a marked increase in the import of *logs*, but the scarcity of large and figury wood from the West Indies enabled the bulk to be sold at good prices, and there is now only a small stock on hand, but the principal enquiry is for figury wood: a few parcels of *boards* were sent in, and being more or less figury they brought very fair prices. Quotations for logs are from 1d. to 12d., and for planks and boards from 9d. to 12d. per foot.

Rosewood.—East India—was shipped more freely, but chiefly in small lots, most of which were placed at satisfactory prices; as, however, the consumption is not large, supplies must be kept strictly moderate or prices would soon suffer. There is sufficient stock for present requirements. Quotations are from £6 to £10 per ton.

EBONY.—Ceylon.—The import, although not heavy, was still considerably in excess of the previous year, and was chiefly of a rather poor character, it therefore only found buyers slowly and at low prices. There was a constant demand for prime, large logs, but none were imported; this demand still exists and a suitable shipment would sell well; most of last year's import was sold, but there is quite enough ordinary wood on hand to meet current wants. Quotations are from £6 to £8 for ordinary to fair, and from £10 to £15 per ton for good to prime logs, of large sizes. East India.—Shipments were again limited to two small parcels; the first sold well, but the second remains on hand, as the demand recently has been rather quiet. Sound logs, of good sizes and colour might be sent, but only in small lots. Quotations are from £6 to £8 per ton.

PADOUK.—The heavy stock brought forward was materially increased by a large cargo, which arrived in July. The absence of any improvement in the export demand, or in home consumption, not only prevented any reduction of stock, but caused a heavy accumulation, which, unless an unexpectedly large demand arises through the scarcity of Mahogany, it will take a long time to clear. Quotations are from 2s. 6d. to 3s. per foot cube for planks and logs.

CEDAR.—The only shipment from Malabar (9 logs) came in when the market was very dull, and although the logs were of good sizes they were in poor condition and realsed low prices. As this quality is not much appreciated, only large, sound, light-coloured wood is likely to give satisfactory results. Quotations are quite nominal at from 3½d. to 4d. per foot.

MARKET RATES OF PRODUCTS

Tropical Agriculturist, December, 1896.

Cardamoms	per lb.	1s. 10d.	to	2s. 8d.
Croton seeds	per cwt.	50s.		
Cutch	,,	20s.	to	30s.
Gum Arabic, Madras	,,	12s. 6d.	to	50s.
Gum Kino	,,	£25	to	£30.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s. 2d.
,, Burma	,,	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay,	per cwt.	7s. 6d.	to	7s. 9d.
,, Jubbulpore	,,	6s. 3d.	to	7s.
,, Godavari	,,	5s.	to	5s. 6d.
Nux Vomica, good	,,	6s.	to	9s.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton.	11s.	to	15s.
Redwood	,,	£4	to	£4 10s.
Sandalwood, logs	,,	£30	to	£50
,, chips	,,	£4	to	£8.
Seed lac	,,	50s.	to	100s.
Tamarind	,,	9s.	to	11s.

THE

INDIAN FORESTER.

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Weight and Strength of Travancore Timbers.

I have been making some experiments during the last year or two to test the strength and weight of some of our South Indian timbers, and as the Christmas holidays have given me the opportunity of tabulating my figures and notes, it has occurred to me that you may care to have the result of these experiments for publication in your Journal.

The value of P as given below was obtained by suspending weights to the middle of battens 2 ft. by 1 in. by 1 in until they broke, the distance between the supports being 22 inches. Two specimens of each species were tested within six months of felling the trees from which they were cut, and generally four specimens more were similarily tested after a year from the time of felling. The value of P is in most cases, therefore, the average of 6 specimens.

The weight obtained is the average of about 3 specimens of each species, the number weighed varying from 1 to 5. All these specimens were dried for 12 months before weighing.

This method of testing the breaking strain has brought into prominence the importance of seasoning timber destined to sustain a weight. In 91 per cent of the species tried, the value of P increased during seasoning, and in 9 per cent its value either remained unaltered or declined. In several instances, this decline was due to the boring of the wood by beetles or to the wood itself perishing, but as a rule all the better kinds of timber greatly improved by keeping.

The average improvement of all the species which improved in strength was 43 per cent., the decline of those that deteriorated averaged 8 per cent and the average general improvement was 36·4 per cent, a very remarkable result considering that it was the outcome of only six months seasoning.

This conclusion is opposed to the ordinary native idea that timber when thoroughly dried, or "dead" as they call it, is

useless. This idea no doubt originated in the fact that when timber is dry it snaps more suddenly and with less warning than when fresh cut in spite of its greater strength.

It is not claimed that the figures given below would always remain constant for the same species. The strength, and, to a less degree, the weight of specimens, even when cut out of the same tree, vary within wide limits, and all that can be said is that by taking the averages of a large number of specimens it is possible to ascertain the relative strength and weight of the different species tried.

T. F. BOURDILLON.

QUILON,
27th January, 1896.

PROPERTIES OF CERTAIN TRAVANCORE WOODS.

Name.	Value of P.	Weight per cubic ft.	Remarks.
Dillenia pentagyna.	554	44	Hard, reddish-brown, poor.
Polyalthia fragrans.	567	41	Hard, pale yellow, used for masts.
Xylopia parvifolia.	725	44	Moderately hard, greyish white, not used.
Miliusa velutina.	847	50	Ditto ditto yellow, used for shafts, etc.
Bocagea Dalzellii.	788	49	Hard, pale yellow good.
Crataeva religiosa.	279	28	Very soft, greyish white. useless.
Flacourtia Cataphracta.	811	56	Very hard, purplish yellow.
Hydnocarpus Wightiana.	464	36	Soft, greyish white, useless.
Xanthophyllum flavescens.	567	48	Moderately hard, pale yellow, too small for use.
Garcinia Cambogia.	608	47	Ditto ditto pale grey, coarse.
Calophyllum Wightianum	579	44	Ditto ditto reddish brown, good.
Mesua ferrea.	951	60	Extremely hard, red, used for building.
Gordonia obtusa.	533	40	Hard, elastic, pale brown, good but not used.
Dipterocarpus indicus	695	47	Hard, greyish red, useful for building.
Hopea glabra.	857	68	Very hard, pale brown, good but small.
Vateria indica.	415	36	Rather soft, pale brown. coarse.
Bombax malabaricum	519	29	Very soft, greyish white, perishable, used for tea boxes.
Cullenia excelsa.	508	34	Rather soft, pale brown, perishable.
Pterospermum rubiginosum.	...	40	Extremely hard, bright pink and very handsome.
P. Heyneanum.	603	43	Moderately hard, reddish brown, good
Grewia tiliaefolia.	766	46	Moderately hard, pale brown, elastic, used for tool handles..
Elaeocarpus serratus.	508	33	Rather soft, greyish white, bad.
Canarium strictum.	523	35	Soft, greyish white, perishable.
Filicium decipiens.	902	59	Extremely hard, red, good but small.
Melia dubia.	391	26	Soft, coarse, pale red, suitable for rough planking.

Properties of certain Travancore Woods.—(contd.)

Name.	Value of P.	Weight per cub ft.	Remarks.
Dysoxylum malabaricum.	...	45	Hard, straight grained and elastic, much used for oil casks.
D. Sp.	708	52	Hard, reddish brown, not used.
Aglaia Roxburghiana	896	57	Very hard, dark red, useful for spokes of wheels.
A. Sp.	961	45	Hard, yellow, sweet scented but of small size.
Walsura Piscidia.	947	59	Very hard, greyish brown, not used.
Cedrela Toona.	349	29	Soft, pale red, shining, sweet scented, used for Cigar boxes.
Gomphandra axillaris.	358	30	Soft, grey, perishable, very poor.
Lophopetalum Wightianum	467	30	Moderately hard, white, useful for planking.
Kurrimia paniculata.	505	40	Hard, greyish brown, not used.
Schleichera trijuga.	725	66	Extremely hard, pinkish brown, cross-fibred, used for oil-mills.
Nephelium Longana*	1061	61	Ditto ditto, brown, good for building
Turpinia pomifera.	338	27	Rather soft, grey and useless.
Meliosma simplicifolia.	370	31	Very soft, greyish brown, very bad.
M. Arnottiana.	325	21	Soft, pale brown, very poor.
Mangifera indica.	399	41	Soft, greyish white, coarse, used for planking.
Gluta travancorica.	...	53	Very hard, bright dark red, brittle, but good for furniture.
Buchanania latifolia.	452	36	Hard, greyish white, coarse.
Odina Wodier.	673	60	(Heart only) moderately hard. pinkish brown, good for furniture.
Anacardium occidentale.	317	30	Soft, pale grey, coarse and worthless.
Semecarpus Anacardium.	230	35	Hard, coarse, brownish grey & useless.
S. travancorica.	425	28	Very soft & coarse, greyish white and useless.
S. auriculata.	404	28	Do. do. do. do.
Holigarna Arnottiana	343	27	Soft, greyish white, coarse & useless.
H. Sp.	418	32	Do. do. do. do.
Spondias Mangifera.	293	22	Extremely soft, greyish white, perishable and very bad.
Pongamia glabra.	...	49	Moderately hard, coarse, yellow streaked with grey, not used.
Hardwickia pinnata	640	46	Hard, elastic, dark reddish brown, used for planking.
Bauhinia malabarica.	563	56	Very hard, dark brick red to claret coloured.
Xylia dolabriformis.	..	59	Extremely hard, dark brown, much used for building.
Albizzia odoratissima	627	38	Hard, pale brown, smooth. Useful.
A. procera.	738	45	Hard, dark brown, useful for building
A. stipulata.	666	27	(Heart only) Soft, pale brown, coarse.
Pygeum Wightianum	622	44	Moderately hard, pink, even.
Carallia integerrima.	700	47	Do. do. yellow, prettily mottled.
Blepharistemma corymbosum.	574	42	Do. do. greyish yellow, rather rough.
Terminalia Belerica.	720	42	Hard, yellowish grey, coarse, used for boats and building.

Properties of certain Travancore Woods.—(contd.)

Name.	Value of P.	Weig ht per cub ft.	Remarks.
T. paniculata.	636	57	Hard, pale brown, useful for building.
Anogeissus latifolia.	868	58	Heart very hard, dark purplish brown sapwood thick, white, coarse but strong.
Eugenia Arnottiana.	594	56	Hard, dark greyish brown, coarse.
E. læta.	739	55	Very hard, yellowish brown, coarse.
E. montana.	489	44	Moderately hard, pale brown mixed with patches of yellow, used for building.
E. Sp.	830	52	Hard, reddish brown, coarse.
E. Sp.	675	42	Do. greyish brown, coarse.
E. Sp.	766	52	Do. do. do. do.
Careya arborea.	562	65	Very hard, dark reddish brown, warps
Memecylon edule.	851	58	Very hard, yellowish brown, fine grained but liable to cracks.
Lagerstrœmia lanceolata.	596	43	Moderately hard, pale brown, straight grained, much used.
L. Reginæ.	500	41	Do. do. reddish brown, useful
Tetrameles nudiflora.	321	21	Very soft and coarse, greyish white used for boats.
Mastixia pentandra.	331	28	Soft, yellowish grey, bad.
M. arborea.	452	32	Moderately hard, greyish yellow, poor
Adina cordifolia.	...	43	
Stephegyne parvifolia.	656	39	Moderately hard, yellowish pink, good.
Nauclea Missionis.	430	37	Do. do., bright yellow and prettily marked, an ornamental wood but not strong.
Hymenodictyon excelsum.	447	28	Very soft. greyish white, poor.
Webera Sp.	...	61	Extremely hard, pinkish brown, smooth but small.
Randia Sp.	785	53	Moderately hard, pale brown, even.
Canthium Sp.	870	48	Do. do. do. do. good.
Ixora Sp.	628	55	Very hard, reddish brown, good.
Chrysophyllum Roxburghianum.	476	36	Soft, greyish white, coarse and poor.
Dichopsis elliptica.	472	44	Hard, reddish brown, straight grained, much used for shingles.
Bassia malabarica.	471	51	Hard, brownish red, of small size.
Diospyros Ebenum*	1160	69	Extremely hard, jet black, very good.
D. microphylla.	643	49	Hard, brownish grey, straight & good.
D. nilagirica.	605	44	Moderately hard, yellow, no black heart.
D. Sp.	445	46	Hard, white and grey in irregular patches, no black heart.
Symplocos macrocarpa.	455	31	Moderately hard, white & smooth.
Alstonia Scholaris.	416	27	Very soft & perishable, coarse, white.
Wrightia tomentosa.	390	34	Soft, yellowish white mixed with patches of grey.
Tabernæmontana Sp.	391	33	Moderately hard, pale grey & white mixed.
Stereospermum chelonoides.	772	42	Moderately hard, greyish brown, mottled.
S. xylocarpum.	785	42	Hard, reddish brown & good, used for furniture.

Properties of certain Travancore Woods.—(contd.)

Name.	Value of P.	Weight per cub ft.	Remarks.
Gmelina arborea.	523	35	Moderately hard, greyish white. good.
Vitex altissima.	784	60	Do. do. yellowish brown, smooth and good, used for building.
Myristica laurifolia.	356	34	Soft, strawcoloured, perishable.
M. malabarica.	460	34	Soft, yellowish brown, perishable.
M. magnifica.	375	30	Do. yellowish white, do.
M. Farquhariana.	409	34	Do. yellowish grey, do.
M. attenuata.	514	35	Do. pale brown, do.
Cinnamomum zeylanicum*	593	37	Moderately hard, scented, brown and coarse.
Machilus macrantha.	408	36	Do. do., coarse, pale brown, used for boats.
Bridelia retusa.	548	61	Hard, brownish white, good.
Phyllanthus Emblica.	514	42	Very hard, dark red.
Hemicyclia lanceolata.	527	57	Very hard, pale brown, liable to crack
H. venusta.	726	51	Moderately hard, pale grey, cracks.
Bischoffia javanica.	745	52	Hard, dark claret red, very good.
Aporosa Lindleyana.	515	38	Very hard, white and close grained, small.
Baccaurea courtallensis.	569	42	Moderately hard, yellowish white, small.
Mallotus philippinensis	631	44	Hard, brownish grey, small.
Macaranga Roxburghii.	403	27	Soft, pale brown, coarse & perishable.
Trema orientalis.	297	30	Moderately hard, dirty white, coarse and perishable.
Ficus asperrima.	245	24	Very soft & perishable, brownish grey.
Artocarpus integrifolia.	...	33	Hard, bright yellow, much used for furniture.
A. Lakoocha.	577	43	Moderately hard, yellowish brown, good.
A. hirsuta.	573	35	Do. do. yellowish brown, smooth, much used for building.

* Only seasoned specimens tested.

Symbiosis and its effects on the Planting of Forest Trees.

We have recently been reading the "Natural History of Plants" by Professor Kerner von Marilaun of the University of Vienna and translated by Mr. F. W. Oliver, of University College, London, an exceedingly interesting and important work of the greatest interest to botanists and indeed to all who are lovers of Natural History or engaged in work which, like Forestry, has so much connection with vegetable life and plant physiology. The chapter on the subject of Symbiosis has especially attracted our attention and we are sure that Professors Kerner and Oliver will

forgive our quoting a long extract from it and reproducing a copy of one of their figures. The point of chief importance to us lies towards the end where it is shewn that certain trees, and especially Coniferæ, Cupuliferæ (the oak, chestnut, beech, hazel, hornbeam and birch) and Salicaceæ (willows and poplars) are dependant for their nutrition on the assistance of the mycelia of species of fungi which clothe their root caps. It seems to us that an important lesson which forest officers have to derive from this is that in planting young trees of these species every precaution ought to be taken not to remove the earth from about the roots, otherwise the fungus mycelium is apt to be dried up or rubbed off and the planting will fail. In order, therefore, to transplant successfully such trees as the deodar, kail, chir, the firs, and the oaks, recourse must be had either to planting out seedlings from pots or baskets, or to lifting the plants carefully with large balls of earth around the roots. Another point which clearly also requires to be attended to, is the choice of planting sites in localities where the trees are likely to find favourable conditions of soil for the propagation of the fungi with the assistance of whose mycelium they can only manage to thrive. Doubtless, too, among tropical and semi-tropical trees which we are called upon to propagate, there must be many whose life history has not yet been sufficiently studied for it to be known whether they can exist without fungal help so that wherever planting has to be done it will usually be best to assume that such help is required and that the transplanting must not be done without great care being taken not to denude the roots of their earth covering. The advantage of the use of baskets for planting is thus evident and the absence of care to preserve earth round the roots may account for much of the failure which has attended the Departmental endeavours to rear trees on waste lands in India. The following is the extract to which we refer. We are sure that it will be read with much interest.

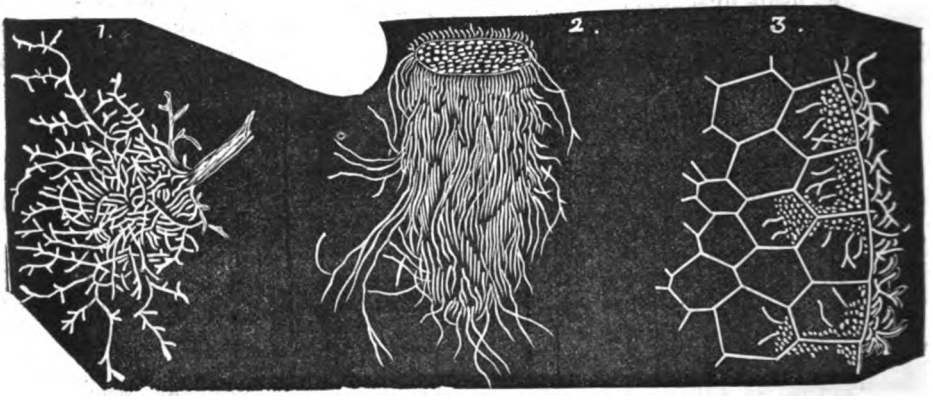
"Another instance of Symbiosis is observed to exist between 'certain flowering plants and mycelia of fungi. The division of 'labour consists in the fungus-mycelium providing the green-'leaved Phanerogam with water and food-stuffs from the ground, 'whilst receiving in return from its partner such organic com-'pounds as have been produced in the green leaves.

'The union of the two partners always takes place under-'ground, the absorbent roots of the phanerogam being woven 'over by the filaments of a mycelium. The first root that emerges 'from the germinating seed of the phanerogamic plant destined to 'take part in the association descends into the mould still free from 'hyphæ; but the lateral roots and, to a still greater extent, the 'further ramifications, become entangled by the mycelial filaments 'already existing in the mould or proceeding from spore-germs 'buried there. Thenceforward the connection continues until

'death. As the root grows onward, the mycelium grows with it, 'accompanying it like a shadow, whatever its course, whether the 'root descends vertically or obliquely, and runs horizontally, or 're-ascends, as is sometimes necessary when it happens to be turn-'ed aside by a stone. The ultimate ramifications of the roots of 'trees a hundred years old, and the suction-roots of year-old seed-'lings, are woven over by mycelial filaments in precisely the same 'manner. These mycelial filaments are always in sinuous curves 'and intertwined in various ways, so that they form a felt-like 'tissue, which looks, in transverse section, delusively like a paren-'chyma. As regards colour, the cell-filaments are mostly brown, 'sometimes they are almost black, and it is rare for them to be 'colourless. The epidermis of many roots is covered as if by a 'spider's web, whilst the hyphæ form a complex tangle of bundles 'and strands broken here and there by open meshes through which 'the root is visible. In other cases an evenly woven but very 'thin layer is wrapped round the roots; and in others, again, the 'fungus mantle forms a thick layer which envelops uniformly the 'entire root (see fig.). Here and there the hyphæ insinuate 'themselves also inside the walls of the epidermal cells, and the 'latter are permeated by an extremely fine small meshed mycelial 'net (see fig.). Externally the mantle is either fairly smooth, 'and clearly marked off from the environment, or else single 'hyphæ and bundles of hyphæ proceed from it and thread their 'way through the earth. When these branching hyphæ are 'pretty equal in length they look very much like ordinary root-'hairs. And they not only resemble them, but assume the func-'tion of root-hairs. The epidermal cells of the roots, which would 'in an ordinary way act as absorption-cells, being inclosed in the 'mycelial mantle, cannot exercise this function and have relegated 'the business of sucking in liquid form from the ground to the 'mycelium. The latter undoubtedly acts as an absorptive 'apparatus for the partner on whose roots it has established itself; 'and the water in the soil, together with all the mineral salts and 'other compounds dissolved in that water, are caused by the 'mycelial mantle to pass from the surrounding ground into the 'epidermal cells of the roots in question, and thence onward, 'ascending into axis, branches, and foliage.

'Thus the fungus mycelium not only inflicts no injury on the 'green leaved plant by entering in connection with its roots, but 'confers a positive benefit, and it is even questionable whether a 'number of green leaved plants could flourish at all without the 'assistance of mycelia. The experience gained in the cultivation 'of those trees, shrubs, and herbs, which exhibit mycelial mantles 'on their roots, does not, at any rate, lead to that conclusion. 'Every gardener knows that attempts to rear the various species 'of winter-green, the bog-whortleberry, broom, heath, bilberries, 'cranberries, the spurge laurel, and even the silver fir and the

'beech, in ordinary garden soil, are not attended with uniform 'success. Therefore, as is well known, soil consisting of vegetable



1. Roots of the White Poplar with mycelial mantle. 2. Tip of a root of the Beech with closely adherent mycelial mantle × 100 (after Frank.) 3. Section through a piece of root of White Poplar with the mycelium entering into the external cells × 480.

'mould from the top layer of earth in woods or on heath is chosen 'for the cultivation of the genera *Erica*, *Daphne*, and *Rhododen-* '*dron*. But it is not even every kind of forest or heath mould 'that can be made use of. When earth of that nature has been 'quite dry a long time it is no longer fit for this purpose. On the 'other hand, it is known that the above mentioned plants should 'be transplanted from their forest home with the soil still clinging 'to the roots, and it is also laid down as an axiom that the roots of 'these plants should not be exposed and should be cut as little as 'possible. The following reason accounts for all this. Firstly— 'Fresh earth from the heath, or mould recently dug from the 'ground in a wood contains the mycelia still alive, whereas in 'dry humus they are already dead; secondly, the mycelia woven 'round the roots are transferred together with the balls of earthy 'matter suspended to them into the garden; and lastly, any con- 'siderable clipping of the roots would remove the ultimate ramifi- 'cations which are furnished with the absorbent mycelial mantle.

'The failure of all attempts to propagate the oak, the beech, 'heath, rhododendron, winter green, broom, or spurge-laurel, by 'slips or cuttings, if the shoot which is cut off and used for the 'purpose, is put into pure sand, is explicable in the same way. 'Limes, roses, ivy, and pinks, the roots of which possess no

'mycelial mantle, are notoriously propagated very easily by put-
'ting branches cut from them into damp sand. Rootlets are at once
'produced on those parts of the branches which are buried in the
'sand, and their absorption-cells carry on the task of taking up
'nutriment from the ground. But though cuttings of oak, rhodo-
'dendron, winter green, bog-whortleberry, and broom strike root,
'no progress in their development is to be observed, because the
'superficial cells of the rootlets, in these cases, have not the power
'of absorbing food when they are not associated with a mycelium.
'It is only when the slips from these plants are put into sand with
'a rich admixture of humus, the latter having just been taken
'from a wood or heath and containing the germs of mycelia, that
'some few are successfully brought to further development. The
'result is even then often not assured, and the cuttings of several
'of the plants enumerated die even in sand mixed with humus be-
'fore they have produced rootlets.

'Seeing also that the result of attempts to rear seedlings of
'the beech and the fir in so-called nutrient solutions, where there
'could be no question of union with a mycelium, has been that the
'plantlets dragged on a miserable vegetative existence for a short
'time and ultimately died, we have good grounds for assuming that
'the envelope of mycelial filaments is indispensable for the Phane-
'rogams in question, and that the prosperity of both is only assur-
'ed when they are in social alliance.

'The facts ascertained in cases of analogous relationship led
'one to expect that the fungus.mycelia also derives some advantage
'from the flowering-plants, the roots of which they clothe, and to
'which they render the service of acting as absorption-cells. The
'benefit in question is undoubtedly the same as that derived by the
'hyphæ of a lichen-thallus from the enwoven green cells. The
'mycelial mantles withdraw from the roots of the Phanerogams
'the organic compounds which have been elaborated by the green
'leaves in the sunshine above ground, and which are conducted
'thence to all growing parts, that is to say, downwards as well as
'in other directions, to the tips of the swelling and elongating
'roots. According to this, therefore, the division of labour be-
'tween the members of the alliance for joint nutrition consists in
'the mycelium supplying the green leaved plant with materials
'from the ground, and the green leaved plant supplying the my-
'celium with substances which have been worked up above ground
'in the sunlight.

'The range of species which live in a social union such as is
'here described is certainly very large. All Pyrolaceæ, Vacci-
'nieæ, and Arbuteæ, most, of not all, Ericaceæ, Rhododendrons,
'Daphnoideæ, and species of *Empetrum*, *Epacris*, and *Genista*, a
'great number of Conifers, and apparently all the Cupuliferæ, as
'well as several willows and poplars, are dependent for nutrition on

'the assistance of mycelia. We find, too, that this condition recurs 'in every zone and in every region. Roots of the *Arbutus* on the 'shores of the Mediterranean are equipped with a mycelial mantle 'in precisely the same manner as those of the low-growing whort- 'leberry of the High Alps.

'Special importance is given to the social life by the fact that 'the chief species of Phanorogams participating in it are of gre- 'garious growth and cover whole tracts of country, forming 'boundless heaths and measureless forests, as, for instance, the 'various heaths, the oak, the beech, the fir, and the poplar. The 'conception of this subterranean life affecting every moorland and 'vast timbered tract is one full of wonder and interest.

'We can now see why it is that the ground in woods is the 'abode of such a profusion of fungi. No doubt some of these 'fungi draw their nutriment exclusively from the store of dead 'plant-organs accumulated there; but others, as certainly, are in 'social connection with the living roots of green leaved plants. It 'is true we cannot yet state precisely what are the species of fungi 'which contract this sort of union, whether generally a definite 'elective affinity exists between certain fungi and certain green 'leaved plants. There is much in favour of this supposition in a 'few cases; but on the other hand, it is very unlikely that each of 'the various Phanerogams occupying a limited area of ground in 'a pine-forest, where a few square metres of earth contain so many 'tangled roots belonging to pines, spurge laurels, bilberries, cran- 'berries, heath and winter green, that they can only be separated 'with difficulty, should select from the great host of fungi growing 'in the forest a different partner. In instances of this kind it seems 'just to suppose that the mycelium of one and the same species of 'fungus enters simultaneously into connection with all or several 'of the plants growing close together; it is similarly probable 'that the mycelia of different species of fungi render to one and the 'same flowering plant the service of absorption according to the 'locality in which it occurs. This surmise is supported by the 'fact that when certain species, brought from distant parts and 'regularly exhibiting mycelial mantles on the ends of their roots, 'reared in our gardens and greenhouses from seed, they unite in 'these abodes with fungus-mycelia, which certainly do not exist in 'the regions where the Phanerogams in question grow wild. 'Thus, for instance, the roots of the Japanese tree, *Sophora 'Japonica*, and those of the *Epacrideæ* of Australia, are found in 'European gardens in social union with fungi, which with us are 'native, but which certainly do not occur in Japan or Australia; 'and it is therefore scarcely open to doubt that the *Sophora 'Japonica* to take one example, associates itself with different 'fungi in different regions.

Savannah Forests in Bengal.

In the recent review of the Bengal Administration Report for 1893-94 a note of mine on the burning of savannahs in Jalpaiguri is reproduced. Might I point out that the accidental substitution of 'They' for 'The' in the seventh line considerably alters the meaning.

As the subject of savannahs is an interesting one, I would like, with your permission, to make a few further remarks *re* your comments on page 23.

There is, I believe, no doubt at all that the 'lowland' savannahs will not produce sal. Indeed I would define a lowland savannah in the Jalpaiguri district as ground too water-logged to grow sa but containing long grass.

The matter of the Savannahs on high land cannot, in my opinion, be so easily disposed of.

The Western Duars has *apparently* been hitherto an uninhabited waste consisting of patches of forest of more or less extent and vast seas of grass-covered land, which lands have only been in a process of conversion to cultivation during the few decades of British rule.

The grass-covered lands then, or—as we now call them—Savannahs, are held to be original, and existing practically since the Duars has presented its present physical aspect.

Taking this view of the case, the natural conclusion is that sal would only grow with difficulty on such lands.

Now, I believe that it is historical that before the possession of the Duars by the Bhotanese, the State of Cooch Behar held all the land up to the foot of the hills, and if so, it is quite reasonable to suppose that they held much of it under cultivation. Whether this is so or not, there is various evidence on the ground that much of the country has been under cultivation where now is only grass. In the largest of all the savannahs extending south of Chamurchi, not less then 100 sq. miles in area, and in which the Muraghat forest in reality forms only patches of sal, I have found abundant signs of old cultivation. Among these are old wells and species of trees planted by Bengali cultivators near their villages, such as jack, bael and kamaranga (*Averrhoa Carambola*). There are moreover signs of permanent, not shifting cultivation, such as the Mechis and Garos even now practise, and which converts annually large tracts of tree-covered land into savannah. I have never seen those trees planted by shifting cultivators. On the old maps of 1863, too, we find the sites of villages marked in what is now reserved forest.

My contention then is: if so much of the land has once been under cultivation and there is reason to suppose that the cultivators avoided virgin forest soil, why should not much of what is now

high land savannah have been under sal forest, and have become what it is through the agency of cultivation and its concomitant, fire? And if the land has once grown sal, why should it not do so again?

Further, in many of the high land savannahs we actually find old sal stumps and isolated living trees of by no means 'poor physique' and all stages can be found between a complete sal forest and a complete savannah.

As far as my knowledge of them at present permits, I would classify high land savannahs, *i. e.* those not in evident depressions, as follows:—

1. Land that never grew sal forest, the water being too far *below* the surface: the previous existing forest probably of *Lagerströmia*, *Stereospermum*, *Sterculia*, *Callicarpa*, *Dillenia*, *Albizzia*, *Premna*, &c.,

2. Land that never grew sal forest, the water being too near the surface, soil usually stong: Characteristic (?) grasses being *Andropogon*, *Anthistiria arunadinacea and A. gigantea.*

3. Land that did and can only grow poor sal: soil heavy; characteristic (?) grasses now being *Saccharum procerum* and *S. spontaneum.*

4. Land that can grow sal forest and probably did: the characteristic grass being now *Saccharum Narenga.*

With regard to the departmental burning of savannahs, Sir D. Brandis's proposals, as far as I have always understood them, were purely tentative and were meant to be superseded as soon as possible by complete protection of the whole forest. In fact as far as I remember, not having his "Suggestions" before me, he at once proposed complete protection for certain forests. I contend that if sufficiently early burnings are regularly annually carried out, the sal would slowly spread into a savannah of my type number 4 above.

H. H. HAINES.

II.—CORRESPONDENCE.

Dripping of Water from Trees.

SIR,

You will probably be able to confirm F. A's experience by communicating with the Divisional Officer of Kheri Division, Oudh Circle.

In the cold weather of 1884-85 I was in charge of some sleeper operations in that division, *Shorea robusta* and *Terminalia tomentosa* being the two sorts of trees felled. Among the latter it several

times occurred that a strong jet of water was tapped by the cooly cutting a shallow blaze for the application of the hammer mark. So far as I recollect, the blaze was generally on a slightly projecting buttress of the bole and about 2½ feet from the ground.

I do not know whether any scientific record has been made of the exact conditions under which this peculiar phenomenon occurs, but the phenomenon itself is common enough and there should be no difficulty in finding out something more certain about it.

I never knew a Shorea to act in this way, the water came invariably from a Terminalia.

M. H. CLIFFORD.

MELBOURNE,
28th January, 1896.

The Assimilation of Nitrogen by Tea-plants.

DEAR SIR,

In his note on "Assimilation of Nitrogen through the Agency of the Root Tubercles in certain Papilionaceæ" published as an enclosure to Mr. G. W. C. Cock's letter on pages 5 and 6 of the January number of the *Indian Forester*, Mr. Cock recommends the planting of Saw (*Albizzia stipulata*) or the Sensitive plant (*Mimosa pudica*) in Tea gardens for the fixation and storing of nitrogen in the nodules of its roots for the use of the Tea plants. Both the Saw and the Sensitive plant belong to the sub-Order *Mimoseæ*. As far as I have read the recent literature on this important subject of assimilation of the free nitrogen of the air in the root tubercles of plants, I have not come across any writer who claims this precious property for the roots of any other plants than those of the Papilionaceæ. I am therefore led to ask you, Mr. Editor, to kindly state for the information of your readers in your next number of the *Forester* whether all or any of the plants of the sub-Order Mimoseæ also possess this inestimable property of fixing the free nitrogen of the air in their roots.

M. R.

Note.—Our Correspondent's question is practically answered in Dr. Watt's paper published at page 343 of our Vol XXI; we regret we can give him no further information.

Is the Lantana a Friend or an Enemy?

SIR,

The Lantana is an abomination, we shall all agree in that, but I am strongly of opinion that it is an abomination that we shall have to put up with, and in many cases, ought to encourage. We have no sufficient experience to come to a decided opinion,

but I fancy I see in the Lantana "the way out" of more difficulties than one, notably as a means of taking possession of the soil to begin with, and protecting the young plants afterwards. I hope no Forest Officers will waste money trying to exterminate this shrub, except by the legitimate method of inserting young plants which will eventually kill it out by their cover.

VELLEDA.

A Forest Departmental Blazer.

SIR

With reference to the letter of G. E. M. and your editorial remarks, I think we ought to have a blazer for all India, and not separate ones for each Presidency. We cannot have a plain green coat, with or without piping, simply because that is constitutionally a boating jacket, and no blazer at all. Whether becoming vulgarized or not, the Civilians have just set up one, and anything that will help to bring a little *esprit de corps* into this Department ought to be welcomed. If we cannot agree upon a fancy pattern, the best thing we can do is to adopt the Civilian idea, viz., purple, for an Imperial Department; white, for an European Service; green for our distinctive color. Failing this, the only practical course is to appoint a Committee of one or more from eachProvince. I enclose a rough sketch.

VELLEDA.

Note.—We regret we cannot show the pattern. It consists of alternate broad bands of green and purple separated by narrower white ones.

Hon. Ed.

Dr. Schlich's Manual, Vol III.

DEAR SIR,

In the December number of the *Indian Forester*, page 471, you have published a notice of Volume III of my *Manual of Forestry*, which consists chiefly of a translation of a review published in the Revue des Eaux et Forêts. In that translation I find the following passage :—

"……and as Dr. Schlich acts the eclectic with great talent '…… the book is not perhaps the best means of initiating us into the 'German processes. It is, however, desirable that this much should 'be translated (into French)……"

This passage startled me considerably, and on referring to the original, I find that the French reviewer's text (Mons. B.) runs as follows :-

"……et comme M. Schlich fait de l'eclectisme avec beaucoup 'de talent……, il n'est peut-être pas de meilleure initiation pour 'nous aux méthodes Allemandes. Il est donc à désirer que cet 'ouvrage soit traduit (into French)……"

This passage, rendered into English means :—

".....And as M. Schlich practises eclectism with much 'talent....., there is perhaps no better initiation for us into Ger-'man methods (than his book). It is, therefore, to be desired that 'this work should be translated (into French)....."

You will observe that what Monsieur B. says is exactly the reverse of what your translation has been pleased to say. Your critic will also find the desired explanation of what l'op. means, if he will refer to page 118 of my book.

W. SCHLICH.

NOTE.—We regret the mistake in translation which we had not noticed. No doubt Dr. Schlich's own version better reproduces the meaning intended to be conveyed by the French writer. As regards the expression l'op we were quite aware of the explanation at page 118 of the book but did not think it sufficient, especially with the little 'o' used instead of the 'nought'. We may mention here that we hear that Dr. Schlich's Manual is being translated into Spanish for the use of the Government Forest School at the Escurial.

Hm. Ed.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Record of Notes on Forest Operations.

Replies having been received to the Circular from this Office No. 2, dated 31st January 1895, generally approving of the arrangement sketched in paragraph 4 for the record of notes on forest operations, I have the honour of inviting your co-operation and that of the officers serving under you in the compilation and editing of notes on the lines already indicated.

It has been suggested that the following subjects should be included amongst those enumerated in paragraph 4 of that Circular :—

Injuries done by insects, fungi, etc.,
Rates paid for forest work,
Miscellaneous ;

and to these or any other further additions that circumstances may render desirable, there can be no objection.

A suggestion that each officer should be supplied with a Note Book showing the headings, with a few blank pages after each, does not commend itself to me ; for the reasons that officers will, as a rule, confine their notes to a limited number of subjects, and that an invitation to write on all subjects is likely to lead to the omission to write on any.

Some officers have expressed the opinion that the notes could conveniently be published and discussed in the "Indian Forester"; but there seems to be doubt whether these notes, which relate more to local matters than to specific points or subjects of general interest, would be generally read in a magazine, and I am disposed to think that the publication of such papers as are suitable for discussion in the "Forester" is quite apart from the preparation and printing of notes on local customs and works.—(*Circular No. 1, of Inspector-General of Forests*).

A Tour Through Kishtwar.

At the end of September, 1893, I started on a tour of inspection of the Chenab forests, which I had not yet been able to visit: the route taken was *viâ* Islamabad to the Marbal Pass, 11,550 ft. to Kishtwar, then up the Chenab as far as Padar, next turning back over the Punji Pass and on through Boonjwar and Bhadrawar into the Ravi valley.

There is no deodar forest up the valley on the Kashmir side, leading to the Marbal Pass and very little other forest till the village of Wylo is passed where a fair extent of inferior pine is met with on the left side of the valley; but its distance from any floating stream depreciates its value at present; this tract contains all the inferior pines but *kail* in small quantites only and some fine walnuts in the lower part of the valley.

The Marbal Pass is a very easy one to surmount, the path leading over grassy slopes on both sides of the range without any rocks; a mule road could be made over it at a comparatively small cost; this would be a great boon to the people of Kishtwar, but to make it of real usefulness two bridges must be built, one over the Maru or Wardwan river and another a mile or so further on over the Chenab just below the Kishtwar plain. I was informed that bridges existed at these two points many years ago, but in the course of time they fell to pieces and have never been rebuilt, their places being taken by *jhulas* which, though the finest of their kind, being broad enough in the footway to carry goats and sheep, are yet useless for the passage of horses or cattle, laden or unladen? this of course is a total obstacle to trade from Kishtwar to Kashmir. It is the more to be deplored as the distance is comparatively short (about 60 miles to Islamabad), and Srinagar is in a direct line from Kishtwar. These two bridges known as Kurai and Bandarkot should be constructed as soon as possible in the interests both of trade and of the people who pay revenue to the State.

After leaving the Marbal Pass proceeding down the Kashar Kol the first deodar forest is met with at some distance before reaching Singhpur. It consists of small scattered patches or

isolated trees, but with closing it is probable that the patches would become joined by process of natural reproduction ; these small plots are collectively termed Panj Nali. At Singpur and below on the right bank there is a fair deodar forest about 2 miles long which contains a moderate number of first class trees. On the left bank there are small patches except at Kharni village where there is a small forest of good growth. This valley, which is termed the Kashar Kol, contains three fair-sized streams, the first to the south is the Naidgam (or Degari) Nala, the centre is the Kashar (or Kashmir) Kol and the third to the north the Sinthan Nala.

The Naidgam Nala joins the Kashar Kol at the village of Pasar Kut, while the Sinthan Nala runs into it about two miles below this at the village of Shatru. The former contains very valuable mixed forest, deodar preponderating, extending some 6 or 7 miles from end to end ; Sinthan Nala also has a large extent of good forest on the right bank reaching some 6 miles up from the junction at Shatru. On the left bank, below Chingam, there are two separate blocks of fair forest, but the large trees are all to be found on the right bank especially near the village of Dangar where trees of large girth up to 16 feet are to be found. As a rule, the forests on the northern slopes in this tract are of the shady damp type and reproduction is greatly wanting. On the left bank at Dangar village, that is, on south-west slopes, and in the two blocks near Chingam on south and west slopes, the natural reproduction is hopeful, and with fires kept out would increase in a marked degree. Lower down on this bank, above Shatru, there is a large block of forest containing deodar but sparsely stocked. Here there is a small Nala known as Gugnar, which joins the Sinthan Nala below Gilar village. In the forest on this Nala there are a number of sleepers cut by Amir Takar, a mate who was employed by Colonel Bahawalan, but who returned to Púnch State in 1846. Little work was done here, and it is stated no payments were made to the sawyers. It is said that both Colonel Bahawalan and Gangu Shah of Jammu cut sleepers in the Sinthan Nala, and there are still a number of sleepers said to belong to the latter, lying in the stream.

Formerly work was done in the Kashar Kot and Naidgam valleys, and it would appear that the first to work here was Diwan Arjan, Wazarat of Kishtwar in 1834 ; he apparently only cut dead trees into logs and these were got out with great difficulty. Next Hira Singh, Agent of Mela Ram of Lahore, felled here, in 1835, under a permit at a fixed rate per tree. He is said to have taken away a lakh of sleepers,—this is the worse kind of permit to give in a forest. The third and last trader to work here was Gangu Shah who began in 1841, and went on under various pretexts till 1848, when he was refused any more extensions. He took out

a great number of sleepers, it is estimated 80,000, and he states he never felled one green tree since his permit was only for dead trees, but as there was no supervision it is impossible to credit this statement. At any rate all private work is now at an end; such sleepers as remain will be brought out by State agency and delivered to the owner at Akhnur. Proceeding down the right bank of this Kashar Kol after leaving Shatru, the next good forest is situated in the two Nalas which join the main stream at Mughal Maidan known as Drabil and Chansiri. There are altogether 5 distinct blocks in the valleys formed by those Nalas, the largest is near the village of Loi. This contains a number of first class trees but the ground is difficult, being precipitous in the upper parts. It is said that Pandit Wasdeo tried sleeper cutting here but gave it up, also that some 400 trees were felled by Hira Singh, Agent of Mela Ram. This forest is of the shady type with much undergrowth and deep ravines; the growth is very mixed and the natural reproduction is bad.

On the left bank below Shatru there is little forest, the grassy slopes being bare of trees till the Sigdi Nala is reached. At the mouth of this there are 3 or 4 small patches of poor deodar forest, but higher, on the west of Sigdi, there is an extensive forest some 3 or 4 miles long which contains fair deodar in the lower elevations. The Kashar Kol valley may be said to end at Saterwadji, for here the stream joins the large Maru River. Between Mughal Maidan and this place there is no forest at the left bank and merely a sparse poor forest at the summit of the range on the right bank.

To sum up there is really good forest still left in the Kashar Kol and since the fellings do not appear to have been heavy it is likely that a detailed examination and enumeration of stock will show that a great many first class trees are available for felling. The forests are mostly very difficult to work, being steep to precipitous, except one or two on south and west slopes in the Dangar Nár. Being of the shady moist type of forest with deep wet ravines, which contain much undergrowth, the state of the natural reproductions is not at all good as a whole. There is not much kail in this valley. Very little damage was observed, the villages are few in the upper part and the people do not appear to indulge in the ruinous practices of barking and torch excavating from living trees to the extent practised in Kashmir. On the whole this may be considered a valley with a very fair extent of forest, containing a good proportion of deodar, while the streams are not too difficult for floating, though the distance to the main river is a drawback. Labour can be had for a moderate quantity of work without much difficulty but extensive operations would require special arrangements for supplies, as the country contains little beyond the local requirements.

Between the junction of the two streams Kashar Kol and

Maru, and Kishtwar, there is no forest whatever on the left bank, and on the right a poor forest of some extent in length but narrow in width stretching from a little below Mughal Maidan to the junction of the Maru and Chandra Bhaga (Chenab) Rivers.

A halt was made at Kishtwar to enquire into certain local cases. While there, the townspeple asked for permission to fell oak trees from the forest above for use in the winter, but after seeing the place and carefully considering the matter I was obliged to refuse, since I could see from what had happened in the past that reckless felling would soon destroy the small forest left near the town. Besides, the lower hill-sides are thickly covered with shrubs of various sorts which can supply their wants and these I said they might cut for the present, but they were distinctly told that, not being zemindars, they had no claim to forest produce free of charge.

Leaving Kishtwar, my route lay up the Chenab which, from Padar till it takes a sudden turn beneath Kishtwar, runs almost directly from east to west, consequently the right bank facing as it does due south is almost entirely barren as regards forest growth, at any rate on the main stream ; in fact though there are one or two forests in side valleys, it may be generally said that all the forests lie on the left bank, *i. e.*, on the northern side of the main range which extends in an almost unbroken line from the town of Chamba on the Ravi to Kishtwar on the Chenab.

From the turning point of the range as far as the village of Amné (after leaving Kishtwar) there is a dense forest of broad leaved species only, this reaches from the crest of the ridge down almost to the Chenab below, it contains no deodar and merely a kail here and there. For some distance after leaving Amné towards Bagnai little pine forest is met with till the Nagri Nala is reached, were above Kowar village is a good deodar forest on steep ground. This extends as far as Bagnai, a distance of some five miles. Mela Ram is said to have felled for sleepers in the Hindi year 1935. Opposite Kowar on the right bank of the Chenab is the village of Sergi and near it the one forest on the right bank so far ; it appears to contain little deodar and from its situation to be of small value. Sergi is a Jagir formely held by Wazir Bandju who died on the 12th October, 1893, while I was on the present tour.

The forest between Kowar and Bagnai is not of one type, in parts deodar preponderates, while on the Negam Nala a fairly big but rocky stream next to the Nagri Nala (up stream), there is a larger admixture of oak and other broad leaved species, and near Bagnai itself there is a great deal of kail (P. E). Just below Bagnai a large stream, called locally Changun Nala, is crossed, this contains extensive mixed forest on both banks for two or three miles, but the stock is mostly of inferior pines and broad leaved species, except for two moderate plots which contain some deodar, one on each side of the

valley. From the Changud Nala there is a continous belt of forest conting deodar, extending as far as Korni village. One part known as Kontinnar was worked to a small extent by Colonel Bahawalan ; beyond this is Changuara village and above it the forest as regards deodar, is of a better class ; there being a good number of first class trees, this plot is as usual generally a mixed forest but some parts are almost pure.

Opposite this across the Chenab is a village called Chicha, which has lately been abandoned by its inhabitants. Above this is a poor deodar forest, but one which will improve with time ; a little higher up are three or four small patches of deodar on precipitous ground.

There is a break in the belt of forest at Karni village, otherwise it would be continuous from Bagnai right up the valley to Padar. It is not of one character ; thus in some places there will be found all the conifers—deodar, kail, tos, rai and chilgoza all together on one hill-side, together with broad leaved species including even ash ; while in places kail preponderates and in others, generally the lower parts towards the river, there are more broad leaved kinds than conifers. After Bagnai almost up to Padar the country is very rugged and steep, in some places huge blocks of stone lie piled one over another as big as a house with enormous oak trees growing in among them ; then a corner is turned and a steep grassy slope is reached without a tree of any kind. In such a country, far from civilisation, roads can hardly be expected and the path leading from Bagnai, nearly as far as Padar, is a mere goat track and goes down to the bottom of a valley only to ascend straight up the other side and thus it continues for several marches ; altogether this is a most difficult country to carry on work in, since in addition to natural obstacles, there are very few villages, and of the few several have been lately abandoned owing to various causes and the land lately cultivated is fast lapsing into jungle.

It would appear that very little felling has taken place in this part. I made enquiries, but could only hear of certain work by Gangu Shah at a place known as Nonatu, beyond Piás a deserted village ; and that Sirdár Sujún Singh had felled in a forest called Solo between Kidru and Tatwáni. On the opposite side of the river there is some sparse deodar forest on bad ground, and just in front of Tatwáni is an oak forest, but on the whole there is very little forest worth anything on the right bank from Padar right down to Kishtwár.

The Kishtwár Tahsil ends at Atoli where the Bhutna, a large stream joins the Chandra Bhága ; across the river from here is the Padar Tahsil on the Bhutna river. Above Gulábgarh and on the left bank there are 9 or 10 small plots of deodar which are worth conserving as they lie just over the river.

There is also more deodar forest higher up the Chandra

Bhága towards the Sansari river, which forms the boundary between the Kashmir and Chamba States, but as it was late in the season I could not spare the time to visit this part during the present tour.

It is therefore certain that the State possesses valuable deodar and other conifer forests on the Chandra Bhága and on the Kashar (or Kashmir) Kol, but owing to their constitution, that of having not only pines but a large proportion of broad leaved species such as oak, ash (in a less degree) maple, horse chestnut, &c., they will require far more delicate handling than the type of forest found in Kashmír ; since, unless the greatest care is taken in carrying out fellings, there will be the danger of other species, even the broad leaved, taking the place of the deodar. For the present, therefore, until trained officers are available who shall carry out demarcation and ascertain the capability of the forest as to yield, the work should consist solely in clearing the Nalás of stranded logs whether by launching, where possible, or cutting into sleepers, utilizing the dead and fallen trees, and finally cutting out dying and badly shaped trees. When these sources fail we shall probably be ready for systematic fellings, but on no account should more be done till then, however tempting the market rates may be and still less should the old and pernicious system of permit felling be returned to.

From Tatwáni village at the extreme end of Kishtwár my route now lay up the Bángar Nála to the Punjidhár or Pass which according to the map, leads into Boonjwár, but after a most arduous ascent and descent over the Pass which must be 15,000 above sea level, I found myself in the Sharoti or Koli stream in Sooroor Iláka. There is little forest in the upper part of the valley and very little deodar at all. At Goro village there are two forests containing deodar, but of small extent, they however contain some fine trees, two measured 18 and 14 feet girth and were standing close together. It is said that some 10 years ago Sant Singh of Amritsar cut some trees below this in a place called Churusu, about 300 or 400 trees.

From this valley I crossed the range into the Boonjwáh valley to enquire into some fellings reported to be going on in a State forest. Joalpur is the principal village in Boonjwáh, and the Tahsíldár of the jágír (the late Wazír Sheb Saran's) lives at this place. There is little forest on the right side of the Kailnái stream which drains the valley, the only pieces being two small deodar forests on the spur above Joalpur and one fair patch of oak forest above them. The great forest in this *jàgir* is on the left bank just opposite Joalpur, it extends from the village of Dichal, down stream, for a distance of some six miles upwards, the western part has many blank spaces and much broad leaved growth ; the best part is between the Alni and Kinsnál ravines, but all the mature trees are being rapidly cut out. From its position on the

northern side of the range which naturally marks off the Bhadrawár *jágir*, it is clear that this forest is part of the Boonjwáh *jágir* and as such would appear to be a State forest, since the jágírdár has no right over the forests; but the Agents of the Bhadrawár *jágir* have been and are cutting many thousands of sleepers yearly; the matter has been referred for settlement, as in such important matters there should be no room for doubt.

For the next three days the route lay through the Bhadrawár *jágír viâ* Charao and Jaora to Bhadrawár town. As this is private territory it need only be said that there is still fine forest left in Basnota on the Kar Nála with a good proportion of deodar in the lower portions; also a long narrow strip on the ridge above Zunglewár; a good extent in the next valley to the south known as Badota, some good patches at Chinta nearly pure, and some nice plots of good extent at the head of the valley above Bhadrawár town towards the Chattardhár Pass, but from want of proper conservation these forests are fast deteriorating.

My route lay over the Chattardhar Pass into the Sarthal or Jabbar Nála draining into Siáwa river which forms the boundary between Chamba and Kashmír territories.

Near the head of the Pass (10,100 ft.) there is a good deal of oak forest gradually passing into spruce and silver fir as the valley is descended; on the right bank it is continuous for 5 or 6 miles but not of a good class, reproduction being very poor. On the left bank above Sarthal village there are 5 or 6 small plots of nearly pure deodar none over 200 acres or so in extent, but these contain some excellent young growth. Fellings went on here years ago under the late Mehta Kashu and he appears to have felled every mature tree, even to those on the ridges which should have been left for seed. Between Sarthal and Chunchli there are a few small scattered plots of deodar on steep ground, but here also everything of any size has been felled, the hill sides being now dotted with white stumps; on some ridges not a tree remains large or small. Below Chunchli there are a few small plots of deodar on both sides of the river, and in the Kinsun Nála, which joins the Sarthal at Chunchli (though it is not shown on the map), there is a large extent of mixed forest which will require a detailed examination. Extraction is still going on here, a number of sleepers are now being brought out by Cheta Rám who has brought trees from Ganesha Mall, who in turn bought 700 trees in Sawan 1,943 from the then Basoli *jágír*. It is very unsatisfactory, so long after the *jágír* was resumed by the State, that traders should still be working in the forests, but nothing can be done till these sleepers are cleared out; the fear is that by collusion with the establishment the traders may go on felling trees and in the present weak state of the Department, this will be most difficult to prevent. Above the village of Banni there is a fair deodar forest but almost entirely worked out.

From here I turned off to the east up the Sandrun Nala. Above Aso there is a nice little deodar forest almost pure, with very fair reproduction. The Sandrun valley in its upper parts is very well wooded, but the forest is very mixed and does not contain much deodar. Here also the usual destructive fellings went on when it was *jágír* property and there is little left to cut.

To show the ruthless way these traders worked it may be mentioned that on the Siáwa valley there is only one small forest in the Bandar Iláka, this contains a *deota* and is considered to be sacred by the villagers. They informed me that the traders felled every large tree in it during 1886; they say they protested but were told it was the order and after all merely 40 trees were obtained altogether.

From here my tour ended, and I proceeded *viâ* Dalhousie and Lahore back to Srínagar, the season being too far advanced for any more work in this part.

From what I saw of this part of the Rávi and from many enquiries made, it is quite evident that the Rávi forests have been completely worked out in the period during which they formed the Basoli *jágír*, and nothing now remains but to shut them up absolutely until they have been demarcated and carefully inspected in detail; when a trained officer is available for this division, it may be possible to undertake small fellings of dead and dying trees sufficient to cover the cost of their up-keep but on no account should anything be done till then and never should a trader be allowed again to put foot into this region. The forests of the Sarthal valley are generally on dry ground and as is usual the natural reproduction is much better than in those of the humid type on the Chenáb, and there is no doubt that after a long period of closing and careful management, they will again become of great value to the State. In conclusion I may say that it is absolutely useless to try and manage these Chenáb and Rávi forests without a large increase of establishment and without a trained officer over each division. Lying as they do at a great distance from head quarters it is quite impossible for the Conservator to give them as much attention as can be given to those nearer home, and therefore the subordinate establishment must be stronger and of a better class than that in more accessible regions.

(Sd) J. C. McDONELL,

Conservator of Forests.

IV.—REVIEWS.

Forest Administration in Kashmir from 1891 to 1895.

We regret that we have been obliged so long to delay our review of the Kashmir Reports before us.

The appointment of Mr. J. C. McDonell as Conservator of Forests in Kashmir was made on June 11th, 1891, so that it is now something less than five years since a beginning was made in the introduction of systematic conservancy. That much has been accomplished is clear from the Reports before us, and it is equally clear that it has been uphill work and that much opposition has had to be overcome, partly from the village people partly from the Sirdars, partly sometimes from the Maharaja, and partly even from the British officials in charge of other Departments of the State. The single fact that the revenue assessments made by the Settlement Commissioner Mr. W. R. Lawrence, C. I. E., were made high on the assumption that they included large rights of user in the forests, must have enormously hampered the forest Conservator's selection of reserves and his endeavours to obtain even some small portions of the best deodar areas free, or nearly so, of antagonistic rights. In his recently published large work on "The Valley of Kashmir" Mr. Lawrence says as follows:—"I would 'urge most strongly that no restriction should be placed upon 'these old rights of user in the forests. If however, forest conser-'vancy does impair these rights, it will be necessary to reconsider 'the rates put upon the land by me for I would never have taken so 'high a revenue had I known that timber and fuel would be charg-'ed for by the State." Comment upon this extraordinary arrangement is almost superfluous. That in such a state as Kashmir large forest rights or concessions would have to be given and liberally given, we can fully understand, but they should have been given at a *forest* settlement and properly recorded. As a forest settlement will have to be done some time, it was surely unnecessary to make it more difficult by allowing a Revenue Settlement Officer to give away large undefined forest rights in order to show a great increase in the land revenue of the country. And it is doubtful if Mr. Lawrence's arrangements were really fair on the people, for in another place he says:—"Up to the present the agricultural classes 'have been allowed timber for their houses and farm implements 'and fuel free of charge" so that it would seem as if his arrangements were such that their old rights were now to be paid for and the proceeds made to swell the revenue from agricultural land at the expense of that from the forest estates. There are other references to forests in Mr. Lawrence's book which we need

Extra Pensions for Forest Officers.

We have just received the following Resolution of the Government of India (Circular 4F. of March 16th, 1896) which we feel sure our readers will be interested to see.

READ—

Circular No. 5 F., dated the 7th May, 1890, forwarding extracts from a Despatch from Her Majesty's Secretary of State, No. 41 (Financial), dated the 6th March, 1890, relative to the memorials submitted by covenanted officers of the Forest Department, praying for the extension to them of the special Pension Rules sanctioned for similar officers of the Public Works and Telegraph Departments.

(ii) Resolution in the Finance and Commerce Department, No. 1303 P., dated the 18th March, 1895, extending the scale of pensions laid down in article 712 of the Civil Service Regulations to officers of the Forest Department who have been, or may hereafter be, appointed from England to that Department.

READ also the following Despatch from Her Majesty's Secretary of State :—

No. 230 (Financial), dated London, the 26th December, 1895.

From—LORD GEORGE FRANCIS HAMILTON, *Her Majesty's Secretary of State for India,*

To—The Government of India.

I have considered in Council Your Excellency's letter dated the 23rd of October, No. 299, respecting the advisability of granting to the existing members of the Indian Forest Service the advantage of special pensions, corresponding to those granted some 12 years ago to the Public Works Department.

2. You rightly state that such a concession has been repeatedly recommended by the Government of India since 1885; but it has been more than once pointed out, in reply, that privileges granted for exceptional reasons to one Department need not, therefore, be granted to another Department which in many respects was on a different footing.

3. Lord Kimberley's Despatch of the 21st September, 1893, No. 188, was intended to settle the question by laying down corresponding conditions for all Departments in future—an arrangement to which Your Excellency has given effect by your orders published on the 18th of March, last.

4. I see no reason for now re-opening the question. The Forest officers, whether at present in your service or hereafter to be appointed, will be entitled, if recommended for special merit, to an extra pension of Rs. 1,000 per annum after three years of approved service as the head of the Department in any province.

5. As to the precise manner in which this regulation shall be applied, I notice that you propose to make a further communication.

not now refer to, except so far as to say that they evidently shew much personal bias against forest conservancy and do not mention, as in honesty should have been mentioned, that a Forest Department was at work, trying to reconcile the preservation of forests and the improvement of the forest estate with the interests of the people and that much success had already been obtained.

The 1891-92 Report shews what was done the first year to organize work. The first work that had to be taken in hand was the proper regulation of the timber trade which had got into a bad system ; to take stock of the forest areas which would have to be taken in hand for reservation ; to start demarcation ; and to organize a staff : and the Report contains interesting accounts of the Conservator's tours and the observations made during them. The state of the timber works is best understood from the following extract :

" In the Jummu Province which includes part of the Jhelum 'Forests, those on the Chenab and the Ravi, the system of working 'hitherto has been to advance large sums of money to contractors 'and Forest officials and send them into the forests with instruc- 'tions to cut a certain number of trees, logs, or sleepers. As there 'was no responsible officer to settle these accounts, they are 'all outstanding at the present time. The contractors, &c., declare 'they have done more work than is covered by the amount receiv- 'ed, but proofs are not forthcoming, they perhaps naturally 'decline to bring out the sleepers, &c., cut by them unless more 'money is advanced, this the State can not do and so matters are 'at a dead lock, and much time must elapse before these old 'accounts can be settled. The final result of such a system of 'working could only be the complete clearing out of all saleable 'trees from the forests ; a contractor would naturally fell every- 'thing nearest to his line of export, leaving a perfectly bare region 'behind him, except for such trees as did not contain timber worth 'the felling and thus the destruction of the forests was being 'gradually brought about."

" In the Kashmir Province, which comprises roughly speaking 'the valley of the Jhelum above Baramula, an entirely different 'system prevailed ; here there were few or no State fellings, but 'contractors and villagers were allowed to enter any forest and cut 'whatever they liked without restriction as to number, size, kind 'or locality, On arrival of the produce at certain stations the 'State officials took toll in kind, mostly one-fourth of the produce, 'This share, with certain other taxes, produced the revenue of the 'forests and provided the stock in hand in the State Depôts. This 'system caused more damage to the forest than that in vogue in 'Jummu, for, whereas there it did not pay to bring out small trees 'owing to the loss *en route* to the plains, in Kashmir the rivers 'being very smooth all timber down to the smallest pole could be

'safely landed in Srinagar without loss; hence everything was cut 'from the young sapling of 3 inches diameter to the mature tree. 'Besides the destruction of the forests, in many cases amounting 'to absolute denudation, there can be little doubt that the State 'obtained nothing like its legitimate share of the produce, for there 'existed no proper plan for checking the quantity brought out; in 'fact the revenue was entirely dependent on the honesty of the 'officials at the toll stations, and it can readily be imagined that 'any man who could bribe sufficiently high need by no means give 'the legal proportion of the produce exported by him from forests.'

The 1892-93 Report does not record as much progress as might have been hoped for, owing to a series of untoward circumstances which are thus described.

"The past year was one of calamity for the State in several 'ways: first, a very serious fire occurred in the city of Srinagar 'early in May, by which some 1,300 houses were burnt to the 'ground; this was immediately followed by a very severe epide- 'mic of cholera which began on the 9th May, reached its height 'on the 23rd and gradually declined till it practically ended about 'the middle of July; added to these misfortunes there was a 'scarcity of food grains. The Forest Department was much 'hampered by all three, but the worst was the burning of the city, 'for it threw on its shoulders the task of supplying an enormous 'quantity of timber, and that at a time when, owing to the drying 'up of the feeder streams, there was no water wherewith to float 'timber; when also there was much sickness among the establish- 'ment, as yet a weak one, and the Conservator himself was laid up 'during nearly the whole of September with a serious attack of 'remittent fever. To add to the difficulties of work, owing to the 'very scanty snowfall in the winter of 1891-92, they tributaries of 'the Jhelum, such as the Pohru, Arpat, Sind, Dudhganga and 'others, contained very little water in the spring when from the 'melting of the snow they are usually full, and the result was an 'absolute cessation in the supply of firewood logs."

So, too, in the Report for 1893-94 is another disaster recorded which is best described in the Conservator's own words:—

"As last year was marked in Kashmir by the two misfor- 'tunes of fire and cholera, so the present year has had its calamity 'in the shape of the greatest flood that has occurred during the 'past half century. Heavy rain began on the 16th July, and con- 'tinuing all over the higher mountain ranges for four days, caused 'a universal swelling of all the feeder streams, culminating on the '21st in a great flood, which swept down the Jhelum, submerging 'the lower part of the valley; the embankments around Srinagar 'were breached and water stood in the European quarters to the 'depth of nearly 9 feet. The second bridge in the city was swept 'away and the *débris* dashing against the third, took that and the 'other four lower bridges with it; nearly every bridge on the

'Jhelum valley road was carried away including the fine iron girder 'bridge at Domel and the Kohala suspension bridge. The damage 'to villages on the river bank below Srinagar was very great, 'many being submerged ; happily the loss of life was small, and 'as the houses were of a flimsy description, the damage was soon 'repaired.

'The Forest Department suffered with the rest, as nearly all 'the timber in the Pohru river, consisting of logs, scantlings, and 'firewood, was swept out into the Jhelum and so to the plains ; the 'Depôts at Meri, Sukhchenpur and Jhelum were entirely cleared 'of all timber and sleepers collected there and the State put to a 'heavy loss. In addition to the heavy expenditure in re-collecting 'the timber, much was lost by theft on the part of villagers on 'whose land the timber was stranded, but for this there was some 'excuse, since in some places the ground was so thickly covered 'with timber as to prevent the possibility of ploughing it.

'On the Chenab, also, there were heavy floods, which swept 'much timber past the catching places and necessitated the form- 'ing of Depôts below Wazirabad up to Mooltan, but on this river 'the damage from the flood was not so great as in 1891-92."

This Report records considerable progress in demarcation work and the commencement of fire conservancy though the difficulties in the latter were very great to judge from the Conservator's description, which we reproduce.

"These fortunately seldom happen in the Kashmir valley, 'principally owing to the climate being a moist one, the vegetation 'seldom becoming very dry, and in some small degree to the pre- 'sence of the Forest Establishment. In the Upper Jhelum and 'Kishanganga and also the Upper Chenab regions, however, mat- 'ters are in a very bad state as regards fires. In the Ramban 'tahsil, which was visited twice during the year by the Conser- 'vator, not only were many traces of fire seen, but several fires 'were actually going on while he was at Ramban. The Forest 'Establishment is not strong enough to cope with the apparent 'determination of the villagers to burn the grass at all hazards ; 'help must therefore be looked to from the Civil authorities. So 'far in Ramban this has not been given, there having been great 'laxity shown by the Tahsildar in dealing with certain cases sent 'up for trial. The state of the forests between Ramban and 'Ramsu and on the Banihal Pass is typical of annual burning ; 'there is no young growth of any kind, chil or other ; the hillsides 'look hard and dry, and from these being constantly burned the 'water rushes off in torrents, causing landslips in every direction, 'especially at Ramsu. It is the old custom, the people say, and 'unless they burn, how are they to get grass for their cattle ; the 'Civil authorities appear to agree with this view, judging by their 'apathy in the matter, so that it will take years in time and a large 'increase in establishment to bring about a better state of affairs

'To show the sort of difficulty to be contended with, it may be 'mentioned that when the fires were observed within 3 or 4 miles 'only, the Conservator inquired whether the Forester had gone to 'the spot, and the reply was in the negative, but he had sent a 'Guard."

We now come to the Report for 1894-95 which having no special disasters to record gives an account mainly of progress of work. We gather that there are now 7 Forest Divisions, viz: Kamraj, Kashmir, Udhampur, Mozafferabad, Bhimber, Jasrota and Jammu with river Divisions on the Jhelam, Chenab and Ravi. There are 12,498 acres of forest completely demarcated, 242,300 acres of forest or hill ranges of which the lower boundary only has been demarcated and 489,367 acres of undemarcated forests, making a total of 1,163 square miles. Of course this does not represent the whole area that it is intended to reserve, for naturally the first forests to take up have been those of deodars and Chil (*Pinus longifolia*). Demarcation is going on as fast as the necessity for careful work allows, but there has been a good deal of opposition, especially from the holders of 'jagir' lands, for clearly a jagirdar who is not called upon to pay land revenue for the forest he appropriates, will make a greater outcry than the villager who directly he breaks up forest lands is assessed by the revenue authorities. We are glad to see that the demarcation is being done by means of good cut lines and not by the dangerous practice of putting up marks at intervals and leaving the lines between uncut so that encroachments can be made at will. Survey work has been begun and 162 miles of boundary have been mapped.

It is difficult to estimate the success of fire protection for there is no statement shewing the area which it is endeavoured to protect and all that is said is that there were 96 fires covering an area of 34,419 acres. As usual in most parts of the Himalaya, Gujars were the chief culprits.

The amount of timber removed from the forest was

		c. ft.
By state agency	...	1,095, 649
„ purchasers	...	2,099, 441
Under free grants	...	532, 791
Total	...	3,727, 881

The rates of sale of deodar timber vary on the different rivers: on the Jhelum Rs. 0-7-9 per c. ft. was realized, while on the Chenab it was Rs. 0-8-3. The average price received for sleepers was Rs. 2-8-6 on the Jhelum and Rs. 2-0-7 on the Chenab.

The revenue and expenditure for the four years of Conservancy has been

	Revenue.	*Expenditure.*	*Surplus.*
	Rs.	Rs.	Rs.
1891-92	6,27,731	1,20,207	5,07,524
1892-93	4,66,681	1,58,192	3,08,489
1893-94	3,92,533	1,88,001	2,04,532
1894-95	5,20,057	1,81,319	3,38,738

During the first two years the revenue was high owing to the sales of old stock in depôt. Since then regular working has gone on and the revenue both *gross* and *net* shews every sign of gradual improvement. With such a large surplus, the State ought to be able to afford a better establishment and to spend much more money on demarcation, protection, and communications and the housing of the staff all of which may be expected to lead to a still greater improvement in the forest outturn and the forest finance.

The articles of Minor Produce sold seem to be very numerous and to require some enquiry as the knowledge of what they are cannot fail to be of interest. 'Chob Kuth' we understand is '*Saussurea Lappa*,' 'Banafsha' is the violet, but the following, among others, seem to require identification :—'Barg Tuz,' 'Kahzuban,' 'Guchhian,' 'Bekh Roil,' 'Ashkhar,' 'Buzzala,' 'Parshaushan.'

There are appendices to nearly all the Reports giving accounts of great interest of the Conservators' tours in the various provinces and valleys, some of them, perhaps, if we have space, will be reproduced in this Journal from time to time.

The whole work done so far reflects great credit on Mr. McDonell who has had to work almost alone and without the staff of trained officers that a Conservator has in a Circle in a British Province.

VI.—EXTRACTS, NOTES AND QUERIES.

A Fire-resisting Tree.

An interesting account of a fire-resisting tree is given by Mr. Robt. Thomson in a consular report on Columbia. He writes : the thousands of square miles of natural pasturage on the plains and lower hills of Tolima assume during the rainy season the most beautiful verdure. But in the alternate season of drought the general aspect is that of a desert. These lands were originally acquired at a nominal cost. No conservation of the natural fertility of the land has ever been taken into consideration. On the contrary, the natural grasses, intermixed with scrub or brush wood,

have been systematically burned from year to year and the burnings effected during the most scorching periods of drought. The principal object attained by this process of despoliation is the reproduction of new and tender herbage or pasturage, which, with the advent of the rainy season, forthwith covers the parched surface. Vast pastural regions scores of thousands of square miles, in tropical America, are thus maintained. Half a century, or it may be a century, of this treatment suffices to extinguish almost every trace of fertility in the soil. In Tolima alone hardly less than 2,000 square miles of savannahs and hills, ascending to some 3,000 feet, have in this way been transformed into comparatively barren wastes. And in other parts of the Republic many thousands of square miles have similarly lapsed by this devastating process.

This persistent burning of the savannahs and hills for crops of renewed pasturage plays desperate havoc with all other vegetation, trees, and brushwood. Isolated palm trees, with their intensely hard trunks and endogenous structure, together with groups of brushwood in sheltered or humid spots, sometimes withstand the fury of the flames. There is however one phenomenal exception to this subversive power of the fires. A humble tree with contorted and rugged trunks and branches and scabrous leaves, a tree presenting the most subdued and weird aspect conceivable; this pigmy tree not only resists the fury of the flames, but fire is actually congenial and subservient to its existence, for the tree, instigated by the conflagrations, forms itself iuto great plantations. The name of this tree is Chaparro (*Rhopala obovata*), indigenous in Colombia and South American countries. It attains a height of from 15 to 20 feet, and its distorted trunks measure from 9 to 12 inches in diameter. It is widely distributed in Colombia, for I have found it at the Sierra Nevada of Santa Marta and dispersed inland 1,000 miles from the sea. In contact with great forest fires it maintains a precarious existence. But, as already explained, it usurps dominion in places where no other tree can grow. In Tolima it abounds on the slopes and ridges of the hills at elevations from 1,000 to 3,500 feet. In this department alone hundreds of square miles of the lower hills which have been reduced to sterility by incessant burning are occupied by this diminutive tree, and it assumes the aspect of vast systematically formed and well-kept plantations. This is more than a triumph of the "survival of the fittest." It is very remarkable that these fire-begotton plantations are nowhere crowded to excess; on the contrary the trees are so regularly placed that their aspect vies with that of the most carefully formed plantations. There is a popular belief in Tolima, where alluvial gold abounds that this tree flourishes only on those seductive lands, serving as a guide to searchers after the precious metal.—(*The Forester—New Jersey, January* 1896.)

Camphor Leaf Oil.

The recent high price of camphor, on account of the war between China and Japan and trade monopolies, has caused some anxiety in countries where it is largely consumed, and China and Japan being at present the only two countries where camphor is produced on a large scale, it has been thought desirable that its cultivation should be taken up in other lands. In Japan the camphor trees grow at high elevations away from the sea and only large trees of about one hundred years old are selected for use in making the camphor. From the export returns of this country, it seems that the supply is gradually becoming exhausted. In the island of Formosa the camphor trees are said to be by no means plentiful, and they grow only in certain favourable situations, as far as the climate is concerned, with savage tribes in the immediate vicinity. Here the trees are not considered worth taking until they are fifty years old, and the wood only of the roots and stems is subjected to distillation.

The camphor tree grows very well in India. The Calcutta Botanic Gardens possess a fine avenue of trees, which were introduced in 1802. It grows well in the Ootacamund Botanical Gardens and in other parts of the Nilgiris. It has been planted, as an experimental measure, at Jhansi in the North Western Provinces, and in other districts in the plains. Camphor has been known and used in India for many centuries. In A. D. 642, Indian princes sent camphor as a tribute or offering to the Chinese emperors. At one time the tree flourished in Nepal and Tipperah, a large tract of land lying between Bengal and the Upper Irrawaddy. Within the present century camphor was imported from Chittagong, but it has been said that the discovery of the hill-men of distilling it from the root led to the extinction of the trees.

In Ceylon, the camphor tree grows well at elevations of 5,000 feet and less ; it has the habit of a willow in the island, and it has been suggested that, like a willow, the trees should be coppiced, and the leaves and branches used for preparing the oil. The tree grows for ornamental purposes in Naples and other parts of Italy. Professor Maisch in 1891 reported on the cultivation of camphor in Florida, where it flourished in almost any soil. The solid oil was made from the leaves and branches ; the yield was 4 per cent., and the product was more like that of Japan, as it had an odour of safrol. California has lately become the scene of an industry which has for its object the planting of the laurel camphor and the preparation of the oil for the American market. The tree has also become naturalised in Java, Brazil, Jamaica and other isles of the West Indies, Mauritius, and Madeira.

It is very evident that the camphor tree is able to grow very luxuriantly and extensively in the warmer temperate and tropical parts of the world, far removed from China and Japan, but the slow

growth of the tree would prevent all but large capitalists from opening up plantations and waiting for the plants to sufficiently mature. If it is true that in the island of Formosa the wood only of the larger trees is used, and the leaves and branches rejected, then there can hardly be a scarcity of the trees, or the manufacture must be conducted in a very reckless and extravagent manner. The camphor from the Dryobalanops tree is said to be quite liquid if a young tree is tapped, and solid if it is old. Under such circumstances it would seem that the liquid oil constituted the first stage in the development of the solid substance. It is stated in some text-books on Materia Medica that the stearopten exists in every part of the plant, including the leaves. On the other hand, it is remarkable that the leaves are not used in China and Japan; perhaps the natives have found that the leaves only give a liquid product which cannot be profitably turned into camphor. As there is no definite information on the point to be found in any description of the industry, I thought it would be interesting to try the effect of distilling the leaves. Another reason that encouraged me to make some experiments in this direction was the hearty manner in which some energetic planters of Ceylon have taken up the camphor question.

A large number of experiments have been made and a great deal has been written, with regard to camphor oil, the bye-product obtained in refining crude camphor before it is formed into blocks. This has been proved to be a very variable liquid with a specific gravity ranging from 0·88 to 1·00, an erratic optical rotation, although usually to the right, and containing camphor in suspension, or in solution, or none at all.

The first sample of leaves came from an umbrageous tree growing in the Government Gardens at Ootacamund. Fifty pounds of the leaves in a fresh state were distilled in a large copper still with sufficient water for six hours. Eight fluid ounces of oil were separated from the distillate, giving the yield of essential oil one per cent. The oil had a slightly yellow colour, a specific gravity at 50° C. of 0·9322, and a rotation of +9°·4 in a 2 decimetre tube. It gave off a small quantity of liquid at 160°, and began to boil regularly at 175°.

Collected below 180°	=	20·6
185°	=	31·0
190°	=	15·5
195°	=	10·6
200°	=	5·6
205°	=	3·3
Residue	=	8·6
		95·2

The loss here was occasioned by some of the camphor congealing in the condenser; the amount, however, in this sample

could only be about 10 or 15 per cent. The residue in the retort was quite solid in the cold, and had a yellowish colour and strong camphoraceous odour.

The second sample was obtained from some younger trees grown at Naduvatam on the Nilgiris, a district more than a thousand feet lower than Ootacamund. The leaves were distilled in the same manner as in the previous experiment, but a large quantity of camphor condensed during the process and almost choked up the worm of the still. About four ounces of liquid were collected, having a mass of crystalline matter suspended in it. The oil was strained through cloth, and the solid matter, pressed hard to remove all the liquid portion, was left as a cake of camphor, weighing two ounces. The clear oil had a specific gravity of 0·9314 at 15°C., and twisted a ray of polarised light + 54° in a 2 decimetre tube. It began to boil regularly at 165°.

Collected below 185°	=	13·3
190°	=	20·0
195°	=	15·5
200°	=	20·0
Residue	=	25·0
		93·8

The loss was again accounted for by some of the camphor condensing in the cool tube. About one-half of this oil consisted of solid camphor, or, calculating the camphor already separated, the oil from the Naduvatam leaves contained 75 per cent., which is a very satisfactory result. The camphor dissolved in rectified spirit, twisted a ray of light × 30°. The altitude of the Government Gardens in Ootacamund is 7,300 feet, and it is possible that this elevation influences the formation of the solid stearopten in the leaves. At any rate, it is interesting to know that a large proportion of camphor can be obtained from the oil of the leaves and from the leaves themselves, and probably, if taken from trees grown at a much lower elevation, a much larger proportion of this useful substance could be collected. (David Hooper, F. C. S., in the Pharmaceutical Journal, *January* 1896.)

Mr. Ribbentrop's Report on the Forests of Victoria.

From time to time we have urged attention to the importance of systematic afforestation in this country. The outs and ins of politics, however, appear to militate strongly against long views in the matter. We have learnt at length to do these things better in India. Now Mr. B. Ribbentrop, C. I. E. the head of our Indian Forests Conservancy, has been on a visit to Victoria, where he made a rapid inspection of the forests of the colony. An outline of his impression of what he saw, communicated in the form of a

letter to the Victorian Minister of Agriculture, will be found in the November number of the *Indian Forester*. Mr. Ribbentrop speaks his mind very plainly; and there are important points in his criticism that might with advantage be laid seriously to heart by ourselves, great as are the differences between the two cases.

Roundly, Mr. Ribbentrop pronounces that "in spite of the widely-spread knowledge of the advantages of permanent and effective forest conservancy, yea even of the necessity thereof, State forest conservancy and management are in an extraordinarily backward state" in Victoria. There has been no extension of the area of inalienable State forest since 1887. It is true that additions have been made to the area of the timber reserves, but then these have been counterbalanced by the throwing open of other forests of this character—a fact that proves the inadequacy of permanent conservancy. There has been no endeavour to protect the forests against fire; and Mr Vincent's indictment of 1887 for neglect and waste, in the opintion of Mr. Ribbentrop, stands valid for to-day. In return for the money spent upon the forests by way of protection, maintenance, and improvement, and for the large supplies of timber taken from them, the Treasury receives but a "ridiculously small" income. The forest laws, it is admitted, contain some important points. Mr. Ribbentrop acknowledges that they are sufficient for the primary selection of the areas required. Still they are grievously incomplete. "They do not adequately protect the forest chosen either from alienation, the growth of adverse rights, or against other interference by man." Why is this? The reason is alleged by Mr. Ribbentrop to be political. They were, he says, "in fact first pointed out to me 'by independent colonials, they are political and centre in the dis-'regard of the general public weal, where this clashes with the 'monetary profits of individuals or classes who can exert a direct 'parliamentary influence." The country at large wants to rouse itself and force their duty upon its representatives. If the present system be allowed to go on for any considerable period, a reconstruction will eventually become necessary, of course at enormous cost. A stitch in time saves nine. Neither the finances of the colony nor its general prosperity can in any way justify such far-reaching neglect. If plain-speaking would awaken the Victorians to the profitless system now in vogue, Mr. Ribbentrop's statements should make them wide awake indeed. Could not our Government bring him over to England on a like visit of inspection, andinvite his opinion on our home methods?

What suggestion, then, has Mr. Ribbentrop to make? In the first place, indeed, he has to get the Government into a serious mood. "It is evident to me," he says, "that the protective 'clauses were, even in the latest Bills, never seriously considered." It is painful to read such an allegation against the legislators of a self-governing colony of the standing of Victoria; but, if

it be substantially true, it is better that they should be told it to their face. Mr. Ribbentrop's experience enables him to suggest the Upper Burmah Forest Regulations, the outcome of nearly a generation of Indian legislation, as a general pattern for a Forest Bill.

"In my opinion (he says) it will be quite sufficient if the 'enactment gives power to the Government: (1) To declare any 'area belonging to the State forest, alienable only under the authori-'ty of Parliament; (2) to demarcate such State forests, and to pre-'vent within them the springing up of private rights adverse to the 'State; (3) to provide for the proper protection of such State 'forests from fire or unbounded interference by men; (4) to provide 'for their systematic management; (5) to provide for the protection 'of forest produce in the forests and in transit; and (6) to produce 'for the adequate punishment of persons breaking the forest laws 'or regulations framed under its provisions. I hardly think it will 'be necessary to provide for the protection and management of 'Government forest property which is not declared State forest, 'provided the work of constituting such inalienable areas is started 'at once in the right direction, and proceeded with seriously, ener-'getically, and systematically."

This is extent of power reasonably needed, but it may be inevitable to put up with less. But, assuming State forests created and placed in trust of the Government, it remains to work them "rationally and systematically." Here, again, the example of India comes in most usefully. In India, it has been found advisable, mainly in order to facilitate control—an object evidently in the highest degree essential in Victoria—to stereotype the arrangements of working plans; and Mr. Ribbentrop points to the Indian Forest Department Code as a serviceable basis of suggestion. Some of the examples of the deplorable results of lack of control are very remarkable. Thus—"the State forests between Creswich and Ballarat were years ago thoroughly ruined by entirely uncontrolled fellings on the part of the mining population." In another place, where the Victorian Forest Conservator, Mr. Perrin, had made a radical improvement by felling, leaving only the best and most promising stems, "these, it is almost incredible, the miners had appropriated, felled most recklessly, and partially removed, under cover of Sir John McIntyre's Miners' Circular, which was shown to me, says Mr. Ribbentrop, "on my expressing 'doubts as to its existence.'" These are samples of egregious waste and carelessness. It is a comfortable notion that the forests are inexhaustible, and will meet all demands for hundreds of years to come. It is a notion that is not confined to Victoria either, nor yet to forests. But it is monstrously bad economy; and the results are likely to tell very much sooner, and indefinitely more severely, than easy-going and interested parties bargain for. We trust that Mr. Ribbentrop's breezy report will clear away the cobwebs of indifference and self-regard, and lead to some

effective means towards the conservation of the forests of the colony. We trust also that our own Minister of Forests—so far as we have one—will ponder over the report, and apply its lessons at home, where they are also so seriously needed. (*Daily Chronicle, 16th December, 1895*).

VII.—TIMBER & PRODUCE TRADE.

Churchill and Sim's Circular.

4th February 1896.

EAST INDIA TEAK.—The deliveries for January start the year well with 2,207 loads as compared with 843 loads in 1895. The market has been very excited, and prices have risen £2 per load during the month. In the course of this advance floating supplies in all quarters have been fairly cleared out; and although the rise has been rapid, it must be remembered that it started from a very low level, and has not yet attained more than an average altitude. The magnitude of the business done in the time is the only exceptional feature.

ROSEWOOD.—East India. The stock is small but demand quiet, prices are however steady.

SATINWOOD.—East India—is rather quiet, but stocks are rather moderate.

EBONY.—East India—There is no unsold stock, and good wood, in small lots, would sell well.

PRICE CURRENT.

Indian Teak	per load	£11	to	£16.
Rosewood	„ ton	£6	to	£10.
Satinwood	„ sup. foot	8d.	to	12d.
Ebony	„ ton	£6	to	£8.

MARKET RATES OF PRODUCTS.

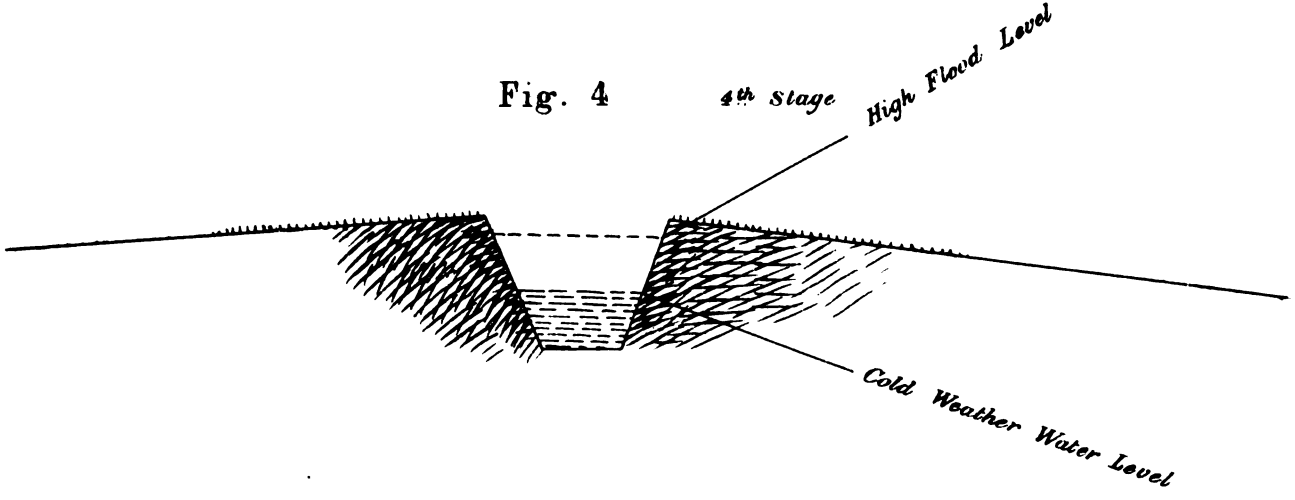
Tropical Agriculturist, September, 1895.

Cardamoms	per lb.	1s. 8d.	to	2s. 3d.
Croton seed	per cwt	50s.		
Cutch	„	20s	to	32s.
Gum Arabic, Madras	„	20s.	to	33s. 6d.
Gum Kino	„	£25	to	£30.
India Rubber, Assam	„	1s. 7d.	to	2s. 2d.
„ Burma	„	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay,	„	7s. 6d.	to	7s. 9d.
„ Jubbulpore	„	6s. 3d.	to	7s.
„ Godavari	„	5s.	to	5s. 6d.
Nux Vomica, good	„	6s.	to	9s.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	„	£4.	to	£4 10s.
Sandalwood, logs	„	£30.	to	£50.
„ chips	„	£4.	to	£8.
Seed lac	„	50s.	to	100s.
Tamarind	„	9s.	to	11s.

Statement of average selling rates of Timbers and Bamboos in Moradabad, Pilibhit, and Bareilly for the Month of January, 1896.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sal 10′ Tors (Poles) ..	20 0 0	25 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0	...	...	
{ Sain...	30 0 0	40 0 0	...	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	..	...	
Bamboos of 9′ to 10′ per 100 score ..	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	40 0 0	100 0 0 500 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	..	...	
Sal & Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0 40 0 0	35 0 0 { 50 0 0 { 60 0 0	... ...	... ...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	137 0 0	

Fig. 4



THE

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The River Indus and the best method of embanking it.

The formation of the alluvial tracts of Sind and the Punjab are due entirely to fluvial deposits which the Indus and its tributaries have brought down in solution. Such deposits continue during many centuries, and their progress is so gradual and slow, that results are never, if ever, visible in the life-time of individuals: it is only by a reference to history or geology that the changes which have taken place in certain localities of the globe by the mechanical action of rivers can be observed.

As an instance of the comparative rapidity and extent of such deposits, it is interesting to mention that about 20 miles of alluvial land has been added to the mainland of Italy since the time of Augustus by deposits from the river Po, for the town of Adria which formerly stood on the coast and which gave its name to the gulf, now stands about that distance inland—similarly the Rhone which enters the Lake of Geneva, a rough muddy stream, passes out a clear transparent blue having deposited its sediment in the lake. The small Roman town of Portus Valesia (now called Valais) which as history records stood on the margin of the lake, is now nearly two miles inland, the river having added to its delta this tract of alluvial land during eight centuries; and in course of time in this manner the whole lake will be filled up. It is even so with Sind; the present tract of alluvial country extending from the Bhangar lands in the Punjab to Ketty Bunder at the mouth of the Indus, has all been reclaimed from the sea by deposits from the river Indus and the process of reclamation is still going on. If the Rhone and the Po can show such marked changes in so comparatively short a space of time, what must be the action of the Indus whose deposits probably are equal in amount to those of the Ganges, regarding which it has been calculated that at 500 miles from its mouth it carries 577 cubic feet of solid matter a second, its annual discharge being equal in weight to the 60 great pyramids of Egypt and so great in bulk that if accumulated upon Ireland it would raise the surface of the whole island one foot in 144 years.

The delta proper of the Indus which now commences about 25 to 30 miles below Tatta was not very distant from that town probably when young Cook was buried there 151 years ago. Old geographies even now have it that Tatta stands near the coast, and this indicates how recently it must have been almost a seaport and how very rapid comparatively are the changes that are now taking place. Tatta is now about 60 or 70 miles from the Indian Ocean and the influence of the tide is no longer felt there. Its ebb and flow are noticeable a little below Kotri Allahrakis where the bifurcation of the main channel takes place and where the delta proper commences. The above details are merely mentioned to show that there are extensive agencies at work in Sind : that the river as it emerges into the sea by its various mouths is gradually filling them up and pushing tongues of alluvial land as it were out into the Indian Ocean.

An inspection of the coast line of Sind would disclose the fact that the ocean for some miles out is tinted with particles of sediment which the river has ejected and which are gradually sinking to the bottom. This repeated deposition of sediment causes the sea along the coast to become shallower and shallower, until at length a mud flat appears above the surface level of the ocean at low water. As a survey of the coast line is being carried out, the new maps prepared by the Survey Officers will supply interesting evidence of the extent of land added in this manner to the peninsula during recent times.

By a process slow and gradual as above described are peninsulas formed ; such as that of Italy already referred to, and that of Florida, and in such a manner, it is repeated, have the alluvial tracts of Sind been acquired from the sea.

The manner in which the Indus performs this task of reclamation and the mode in which land is gradually elevated out of the water subsequently above the river floods, are subjects of geological study, and may seem out of place for description here ; but the circumstances attending the formation and elevation of alluvial land and the effect which such elevation has on the action of the river, have an important bearing on the engineering works undertaken within tolerably recent years in the Province ; and if the various phases through which the stream passes before forming peninsulas be carefully observed, it will be possible to form a fairly accurate estimate of what sort of treatment to give the river in the matter of embanking. No accusation of ignorance regarding the subject on the part of Engineers is insinuated in the foregoing remarks, for there is a distinct conflict of opinion it is known, as to the causes which lead to the action of certain rivers, notably the Po, among scientific men, but the conclusions arrived at here are conclusions drawn from a study of the river *per se* during several years' residence in the Province and of time spent chiefly along both its banks, and it will be interesting probably to record them.

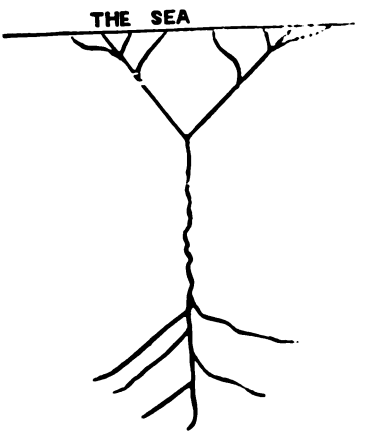
The construction of a delta depends very much upon the position of a river's mouth. The river water charged with sedimentary matter is swept out to sea and there deposited ultimately to form stratified rock. A little reflection would show that supposing the river to be carrying sand and clay in suspension, the sand being heavier would be deposited first and the clay further down near the mouth and lighter particles of clay would be swept out to sea, there to be eventually deposited. If the mouth of the river be swept by an ocean current, some of the particles of clay would be carried out and tint the ocean around (as can be seen in the case of the Indus in the journey from Karachi to Bombay in a coasting steamer) and a counter-current would probably return some of the sediment to the shore at another point before it had time to sink to the bottom. In this way, sedimentary matter might be held in suspension some time and be carried some distance before it finally settled at the bed of the ocean. The Indian Ocean being swept by currents, the constant silting up of Karachi Harbour, for instance, can to a certain extent be accounted for where extensive dredgings to clear a channel for vessels to enter is resorted to. A large part of the lighter sediment, however, which is brought down by the river is deposited at its mouth and along the coast, until in time the sediment or mud flat appears above the surface level of the sea at low water. The mud-flat thus formed becomes intersected with numerous small channels, as the tide which is felt all along the coast, and which runs five miles an hour up stream near Ketty Bunder, recedes. The small channels formed at first by the ebb of the tide would not be obliterated by the subsequent incoming one but deepened, and when the flat became elevated sufficiently above the tidal waters, the irregularities would remain eventually to form water-courses or creeks, and such a net-work of channels may now be seen near and below Ketty Bunder along the coast. The present condition of the lands immediately on the sea board may be taken therefore as the first stage of the delta, showing the manner in which the river ramifies into numerous small channels on meeting the sea.

By this ramification over the flat ground, the velocity of the current of the river is gradually diminished, and the deposit of sediment facilitated, consequently the small channels formed at first are in time filled up, while new ones are cut through the soft alluvial soil * by the river flowing down. The second stage of the delta then is where those constant shiftings of the channels have so elevated the country generally, that instead of a net-work of streams, two or there main arteries would remain forming a triangular island approaching to the shape of the Greek letter Δ delta.

* *Vide* Professor Geikie in his work on Geology.

The process of elevation of this delta would, as may be imagined, continue, as the area in the flood season became subjected to lateral overflows from the channels of the river, and with each overflow would be added a fresh deposit of silt, until the whole deltaic area eventually was so elevated that water flowing in the river instead of ramifying into two or three channels would run into one, the slope of the land by its elevation having caused a swifter velocity in the current of the stream. The stage at which the lands through which the river passed will have entered when this occurred, would be the third, and the country from near Kotri-Allahrakis upwards to Bahawalpur may be said to be an example of it.

But a fourth and final stage of the country yet remains, and that is where the single channel formed by the river *ceases* to overflow its banks, and this condition of things is observable in the case of the Bhangar lands in the Punjab, which are all of alluvial origin, and which are now out of the reach of the highest floods. Undisputed geological evidence exists, however, that they must at one period have been subject to lateral overflow exactly as the lands in Sind now are. The development of the delta in this manner is an interesting geological fact borne out by observation and experience, and it is also interesting in so far as it causes the course of the river to resemble in form, when illustrated on paper, the growth of a tree. Taking the main source of the river as the tap root, we have rootlets, and a stem being thrown out with branches, which in turn ramify at the crown as follows :—



The tendency of an inundation river traversing a flat alluvial plain which reaches the sea by two or more channels if left to itself, would appear to be to form a *single channel*, and although the banks be of soft consistency, to confine themselves ultimately within that channel and not overflow them even in the flood

season, and this is a conclusion which no one after carefully examining the subject will deny. Professor Geikie in his work on Geology, in referring to the mechanical action of rivers, says: "The 'most solid rocks are worn down; deep long gorges are dug out, 'and the water courses when they have *once* chosen their sites, 'remain on them and sink gradually deeper and deeper beneath the 'general level of the country."

Commencing then with the Bhangar lands it is interesting to trace briefly the various stages through which the river must have passed, and ascertain the manner in which it has reached its present condition there.

1st Stage.—

Supposing the delta of the Indus to have formerly stood where the Bhangar lands of the Punjab now are, *i.e.*, presuming the area covered by the alluvial plains of Sind to have been a sea as extensive almost as the Persian Gulf, the manner in which this sheet of water was gradually filled up, will not be difficult to understand after what has been explained.

Immediately near the mouths of the river the deposits or mud-flats in course of formation would, as before explained, be almost entirely of pure clay, and so unsubstantial as to contain the lowest order of vegetation, such as the mangrove. The area would be subject to tidal overflows and be intersected by creeks, and parts higher up being in a slightly more advanced stage, would probably be fit for pasture and rice cultivation. This corresponds with the present condition of the country in the vicinity of Ketty Bunder which now grows grasses and a coarse red quality of rice flourishing from fresh and salt water spills.

2nd Stage.—

As the tongue of alluvial land was driven further out, a little sand would commence to be admixed with the clayey deposit (tidal overflows will have ceased) and the two deposits combined would form a loam capable of bearing a higher order of vegetation, such as Tamarisk which would flourish mainly by fluvial overflows. An inspection of the country as it now exists some miles south of Kotri Allahrakis where the bifurcation of the main channel commences will shew this to be the case.

3rd Stage.—

The onward march of the delta still further out to sea would naturally increase the amount of sandy deposit in what was originally the first stage of the river, for it must be remembered the mouth of the river proper would be now about 80 to 100 miles away, and with the addition of vegetable mould and drift, the soil would become richer and capable of bearing a higher order of vegetation, such as Babul (*Acacia arabica*) and the latter would begin to dominate the banks as is apparent in Sind. As the soil became richer by repeated overflows, in the inundation to which of course it would still be subjected, and grass and trees grew up and increased, the roots of the trees will have commenced to form

a fibrous net-work under ground, the dense grass and other vegetation will have obstructed the outgoing and ingoing of water, and catching more of the sediment, will have gradually formed as it were spoil banks. The flow of water would then be diverted towards the centre of the channel; the overflows would gradually become less heavy and irregular, and in this way by a slow but steady process a scour would set in.

4th Stage.—

But beyond the river and forests of Babul further inland, would be found another class of forest, *i.e.*, Khandi (*Prosopis spicigera*) which would be maintained not by annual inundations but by floods once every eight or ten years—such watery visitations would occur during the third stage of the river and would just keep the Khandi forests alive. Each succeeding flood, though rarer, would heighten the natural spoil banks, until eventually they would be so heightened and became so cohesive and firm, that overflows and erosion would entirely cease. The spills having ceased, the Khandi which is a deep-rootod plant, would have marched up as it were to the margin of the stream to gain sub-soil moisture and to replace the Babul, which being a shallow rooted tree, would now have died out from want of it. When this took place, the fourth stage of the river, *i.e.*, the elevation of the natural flood plain will have been entered (wherever Khandi flourished gregariously near the river bank before the advent of bunds, the overflows were known to be rare). There being no overflows at all eventually and the tendency of the river now being to cut its way down deeper and deeper, the Khandi forests could not endure everlastingly, for subsoil moisture by percolation would not reach the roots and with the browsing of goats and camels, to which the trees would be subjected to above, they would also begin to die out, until at length no natural forests would fringe the banks, and this is the condition of the Bhangar lands which are high above the highest flood level of the river. By such a slow and gradual process extending over many centuries perhaps have the Bhangar lands arrived at their present high and dry stage, and if this is not the only explanation of their origin, surely there is no other. It would appear then that the river after having quitted the second stage of its existence, chose its channel as briefly shewn and proceeded to excavate it, and this process of excavation will continue still further till in after ages alluvial terraces will be left that will mark successive flood levels where the river has at one time or other flowed.

Ketty Bunder, a tolerably large and flourishing town in the delta proper (first stage) now containing several masonry bnildings is on one arm of the river, which it is not improbable will be forsaken before very long in the manner here shown and similarly as the arms on which Shah Bunder and Ghorabari once stood. This is doubtless the cause which finds Brahminabad being

situated so far away from the present course of the river inland, when it is more than probable that at one period it must have stood on one of the arms of the Indus in the delta.

The period when this town flourished is not accurately known, but its greatness probably is coincident with the time when Babylon was at the zenith of its fame (565 B.C.). A very extensive trade wtth India was carried on along the Euphrates during the existence of the Babylonian Empire, and it is probable that Brahminabad being then an important seaport of India, exchanged its wares for those brought from the Persian Gulf. Between the port of Gharra half way up the gulf on the Arabian coast, and India at this thme (565 B.C.) there was, as history records, an active maritime commerce carried on by Phoenician colonists, and Brahminabad possibly was the Indian port at which the Phoenicians touched. If this presumption be correct, the extent of alluvial land added to the Province during 2,400 years can be seen at a glance from the map. That Brahminabad was formerly a large and flourishing town as Sukkur or Kotri now is on the only channel of the river then existing, and this channel suddenly was deserted, is a theory which does not agree with the principle upon which an inundation river acts. The old forsaken beds of the river now observable meandering all about Sind from Bahawulpur downwards, are nothing more than the remnants of former old arms of the river, which have now been permanently deserted and which would exist in *its delta* stage† and which in time would be forsaken, as the latter was thrown further and further out.

As almost every part of the alluvial plains of Sind must have at some time or other formed part of the Indus delta, the forsaken beds of the river would be visible everywhere especially in places where time and floods have not had an opportunity to obliterate them. In the Punjab, for instance, all signs of such old beds will long have been obliterated, but in Sind, as explained, which is comparatively of recent formation, such signs would still be visible. The protective works undertaken during the past 30 or 35 years in the Province, moreover, have assisted to obstruct the complete obliteration of such channels in places, but a great number can still be traced.

During the second stage* the forests fringing the river are mostly of Tamarisk, and the country in the inundation season, for the most part where there are no bunds, is impassable, because of the river floods which sweep over it.

A little Babul also here and there may be seen growing gregariously inland at this stage but it is mostly stunted and immature. The river during this stage, is split into two or three channels, it must be remembered, so that one channel out of the two, perhaps, in a season is not so flooded as the others. Sometimes in one arm of the Indus scarcely any spill takes place in the flood season, the greater volume of water having gone down elsewhere.

† See plan, fig. 1. * See plan, fig. 2.

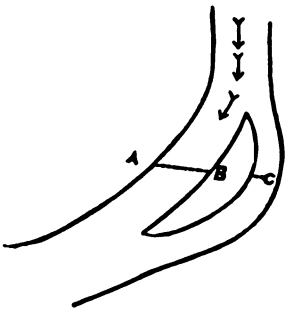
In the third stage* the Babul, according to the theory of the survival of the fittest, has supplanted the Tamarisk on the bank proper, and the latter now can only be seen just fringing the inner toe of the slope of the natural embankment. Further inland may be seen the Khandi which is only reached by the river water in seasons of abnormal floods, but being a deep-rooted plant, entering 50 to 60 feet into the subsoil, it retains its vitality by subsoil percolation mainly from the river.

In the fourth stage † the river banks have no forest trees. Even in the flood season the waters do not spill over this country, and hence artificial irrigation only is resorted to. The is exactly as in the Bhangar lands. Canals, however, take off from the river here to irrigate inland tracts, because as can be gathered the land slopes inland from the river.

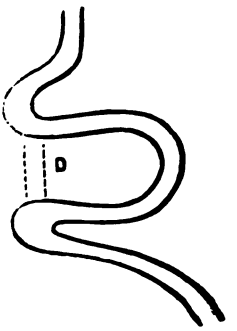
As the third stage of the river developed, the spills over the banks would get slighter and slighter, and if old reports be alluded to, it will be seen that such was beginning to be the case in parts of the Province, showing that portions of Sind had gradually commenced to approach the end of the third stage. In Dr. Schlich's Annual Administration Report for Sind for 1870, when practically no bund system existed, he refers to the difficulty of irrigating some of the Babul forests on the river bank, except by artificial means owing to the absence of annual spills. Any old resident, however, could confirm the statement that the overflows in the Babul region before the bunds were introduced had diminished, whereas they undoubtedly have become heavier, and what is more, in places where for 25 to 30 years no overflow occurred at all, almost annual heavy spills now take place. Observation and experience clearly show in fact that the river after almost completing the elevation of its flood plain, especially in Upper Sind, had before the advent of bunds arrived at a stage when its work of excavation had commenced; that its habit of leaving islands and making tortuous windings and bends thereby causing destructive erosion as in the delta now, had to a very great extent commenced to cease and that the lands on either side had begun to be permannent and the spills to be slight. A reference to very old maps (of 200 or 300 years ago) if they existed, showing the course of the river above Kotri, would probably depict side channels of the river existing, which one by one were deserted as the development of the stage of the river increased. The distance between the extreme left bank of a side channel and the right bank of the stream proper indicated its original natural section. An abnormally heavy deposit of silt and some obstruction of drift had perhaps collected in the channel in its early stages, and instead of being

* See plan, fig. 3. † See plan, fig. 4.

swept away, increased in size, and so split the stream into two parts *pro tempore* as below.



This side channel (C) gradually filled up as the development of the river stage increased, and the distance between A and B eventually formed the remaining main section of the stream. Where considerable tortuous windings existed during the second stage, and a small strip of land intervened between the two encroaching branches of the river, a cut off (D) would occur as follows :—



This left at the side a crescent-shaped lagoon or 'dhund,' and in this manner nearly all the curves and bends commenced to be shaped off as it were, and the section of the stream to be tolerably straightened and narrowed. A study of the river now would show that this process of development which old residents could corroborate no longer continues ; that the waters instead of narrowing and deepening their channel, are taking a more sinuous course and widening their section—carrying away, *i.e.*, eroding what had come to be considered *permanent* land, and leaving more sand banks or kachas visible in the cold weather, which fact is corroborated by the Conservator and Registrar, River Indus, who has

stated that the river navigation is far more difficult than it used to be owing to its shallowness, and owing to the increase in the number of shoals in it, and confirms the oft repeated complaints made in Sind Forest Administration Reports of good Babul forests being washed away, and useless mud and sand banks being left in their place instead. The Indus Flotilla steamers, 30 or 35 years ago, used to travel up and down stream between Kotri and Sukkur and beyond, heavily laden with troops and stores of all descriptions, with apparent facility, but now the Commissioner's steamer "Jhelum" finds it difficult to move along in the river in the cold weather. Quite recently, in fact during H. E. Lord Sandhurst's tour in Sind, the S. S. "Outram" on which he was travelling, stuck on a shoal and delayed him for 24 hours.

There seems to be but one reason for all this, and that is the elevation of the river's section between the bunds owing to the present embankment system which most Engineers, however, will not admit. It is affirmed by some of them that there are cycles of high floods in the Indus, and that after a period repose will set in; but while observations and meteorological data do not support such conclusions, these conclusions are not based according to the *principle* on which an inundation river acts.

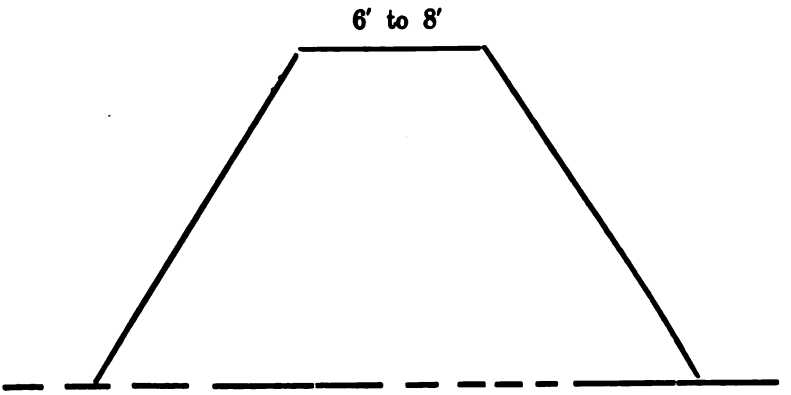
To embank a river like the Indus at all under the circumstances would seem then to be undesirable and opposed to the principle here laid down, and while this is to a certain extent true, there is no doubt that in Sind, where bunds in many places are a *sine quâ non*, it is possible to fix an alignment for them according to observations of growth along the margin of the river which will mitigate the evils complained of. There are three belts of gregarious jungle shown along the margin of the stream, during the *third stage* of its existence, which may be taken as its stage in Sind as far down almost as Kotri Allahrakis (and the embankment system extends some miles below this place) at the present time although in some places these different belts would not be quite distinctly noticed by an ordinary observer. Commencing from the inner toe of the natural spoil bank as it were, the first belt is Tamarisk, then Babul on the summit of the spoil bank and Khandi at the extreme outer toe. According to the experience gained regarding the conditions of soil and moisture necessary for the regeneration of these trees, their existence in the order mentioned along the river supports the theory of the development of the river in the manner already described. It is well known for instance that a certain species of Tamarisk, like the cypress tree of America, affects marshy inundated lands: that Babul requires but little surface moisture and a stiff loam, and that Khandi scarcely any surface moisture and a deep clayey subsoil. According as these conditions exist along the river in its third stage are different jungles arranged. As the development of the third stage of the river continued, the inner toe of the natural bund on which the Tamarisk jungle was

found, would gradually wear away, leaving a more vertical and stable bank on which the Babul stood and the latter would act as a bulwark against the action of the river. (This is what occurred in the Province in many places before the present bund policy was introduced). It was the Tamarisk jungle formerly for the most part that was attacked by erosion—not so much the Babul: the former acted as it were as a buffer to the gradually forming Babul forest. There may have been abnormal natural causes which would tear away the Tamarisk bank and lead to the erosion of Babul jungle as well, but the latter would be but slightly affected. The wear and tear which went on formerly with the river in its natural condition was confined chiefly to the Tamarisk portion of the banks. Huge cracks or fissures would be found in the soil on the Tamarisk banks indicating the existence of excessive moisture in it, which would facilitate the removal of the soil when it became exposed to the action of running water. There can be no doubt that the river banks in Upper and Central Sind on which the Babul forests originally stood, were thought to be sufficiently permanent to withstand erosion, because measures were contemplated when the bunds began to play such bavoc at first, of checking it by chaining the larger trees together along the bank but experience makes it palpable that such measures would be absolutely futile for not all the king's horses and all the king's men would prevent the river working its wicked will on a forest once it made a *set* on it. No means exist of arresting the destructive action of the stream on the permanent banks where the Babul exists since the introduction of the present bund policy.

Engineers also affirm that the extensive erosion which is now observable existed anterior to their bund policy and in fact that it has always been in force; but if this be the case, how is it that extensive forests of mature Babul of 8 to 14 feet girth came to be established along the margin of the stream? For such forests to form, it must have taken at least 60 or 70 years or even a century without any intervening disturbance, and yet no new forest of Babul of even 20 years' growth can be seen to have taken the place of those destroyed already. No sooner now is a forest of Babul eroded then a shoal or kacha is thrown up on the opposite shore, which after a few seasons and before any large growth has had time to form on it, is itself swept away. No time in fact is allowed to the land on either side to become permanent. The sectional area of the stream between the artificial bunds is annually being clogged with silt and the river being unable to accommodate its section to the work required of it, swerves aside to a lower level, which is of course the area outside the bunds, and thus scours its way through thickly deposited silt and jungle, clearing away everything as chaff before the wind.

Admitting artificial bunds, however, to be an absolute necessity in a Province like Sind, in many places it is necessary to

ascertain where they can best be built so as to mitigate the evils complained of, and to find out the proper alignment for embankments the particular stage at which the river *is*, must be studied. The bunds as now aligned in the Province, are, it may be mentioned, almost invariably erected before or through a forest of Babul from below Tatta upwards, and they are merely loose earthen mounds thrown up and rammed into a section somewhat as shown in the following sketch. They vary in height as a rule from 4 to almost 14 feet and cost about Rs. 5,000 to Rs. 12,000 per mile to erect.



Obviously no embankments as protective works would be required and would be of any value in the delta, because as previously shown the river branches into two or three channels owing to its passing over flat ground : the velocity of the current is diminished and the deposit of sediment facilitated, consequently the channels are being constantly filled up and new ones are cut through the soft alluvial soil. Small inexpensive zemindari bunds alone in the delta are recommended to prevent slight spills only, rather than the erection of high earthen walls which while being costly cannot possibly, for the reasons given, endure very long. High embankments close to the river bank in the deltaic region would only be recommended if necessary as works of correction, namely to create a scour for the improvement of the navigation of the stream : such embankments in fact as have been erected in the delta of the Danube under the supervision of Sir Charles Hartley, the eminent Engineer, who in his pamphlet entitled "Inland Navigation of Europe" describes in a brief but interesting manner the various works of correction undertaken by him there and their cost. For the improvement of the navigation of one branch of the Danube alone, the expenditure amounted to £220,000, and such a large sum of money it would be almost impossible to procure for Sind and moreover undesirable to spend on training works on the Indus.

In considering the *Protective* measures necessary in the case of a river in the third stage of its existence as already described, the establishing of the most permanent and stable conditions must be objects in view. Such being the case, the old Zemindari system of bunds which exisited before the British occupation must be at once abandoned, for these were erected close to the river banks and were only useful to exclude slight spills and were the most primitive measures not intended for a state of civilization such as now prevails. Railway and other lines of communication *must* be maintained undisturbed all through the year and the large towns and villages must be protected. Where then should the protective walls be erected in such a case?

Certainly not as in the preseut manner, for they are merely a *development of the old Zemindari bund system.* Wherever a spill occurs for the first time after a long interval, up goes a high embankment near the margin of the stream.

Another is perhaps erected on the opposite bank subsequently to prevent spill there and thus the river eventually becomes closely hemmed in. The embankments in fact appear to be laid out without a thought beyond present necessity. An observation which it is hoped will he pardoned, but from what can be judged, this is apparently the present policy. Sir Charles Pritchard, it is interesting also to note, when Commissioner in Sind, recorded his opinion that "the double line of embankments (*i.e.*, in Lower Sind) did not seem to have been built in pursuance of any definitely stated and sanctioned project."

Erecting a high bund through or in front of a forest of Babul as is usually done under the present policy, for instance, seems a mistake when viewed in connection with what has been described, because the latter stands on the summit chiefly of the natural spoil bank in process of formation and to obstruct a natural flood sweeping over it, is merely obstructing the river in performing a function (of dredging) which nature intended it should. There must be a sort of natural safety valve for the surplus waters and sediment of the river and shutting off this escape abruptly only causes the river to rebel and to eventually attack the bank.

It is for the sake of providing kharif crops mainly that embankments are erected so close to the cold weather course of the river and on grounds of economy also is such an alignment adopted because, as must be patent, the land near the margin is higher than that further inland and therefore bunds, if constructed in the latter place, would have to be much higher, and consequently more expensive, but objects of present necessity such as these and of gaining perhaps a few acres more kharif revenue *pro tempore* should not outweigh more permanent and what are considered more satisfactory conditions in the long run for the Province.

Hemming in the lateral overflow along both banks with the river in its present stage results in the section of the river

between the artificial bunds being scoured at the expense of the river further down for a few seasons only at first where far more sedimentary matter is lodged in the bed than nature intended. As an instance of the way in which sedimentary matter is swept down in this manner may be mentioned the condition of things in Upper Sind at the present moment, where the river passes through the lime-stone rocks between Bukkur and Rohri and sweeps the bed carrying and depositing most of the sediment near Ruk and Madeji which are situated on flat alluvial soil. The river, when in flood a mighty stream about a mile or so wide, is focussed into this narrow Rohri gorge and it rushes with such swift velocity through this passage that the channel is scoured or deepened there at the expense of the river further down so that considerable tortuous windings in the stream in the region of Ruk and Madeji take place in spite of artificial bunds erected to prevent this, resulting in breaches in the Railway line. Were the bank between Bukkur and Rohri not rocky and permanent, no great scour would result here after a few seasons, because so much sedimentary matter will have been deposited in the lower reaches of the river that the longitudinal slope between the section hemmed in, and that lower down will have gradually diminished and this diminished fall would have resulted ultimately in a diminished velocity of the current and hence deposit of sediment in the section of the river.

There can be only two ways of dealing with the Indus in its present stage in the alluvial plains, and that is either to erect embankments so close to the river and so high *and permanent* (*i.e.* of masonry) as will create a scour of its channel, and to dredge it all which with the resources at command it would be impossible to afford or to throw them as far back as possible, as far in fact as *the Khandi forest belt* (Fig. 3) :—Any half-way or what may be better termed short-sighted policy is bound to meet with ill success and to prove disastrous. The suggested measure may lead to a little loss of Kharif revenue, and the initial cost of the bunds would be more expensive, but rabi crops in Upper Sind, and forest growth in Lower Sind and the reclamation of thousands and thousands of acres of kalar or salt land would more than compensate for this.

By excluding water from porous alluvial soil is kalar land formed in Sind, and as no water from heaven reaches it, the country having practically no rainfall to speak of, this land goes on deteriorating until it becomes eventually unfit even for pasture. Forest Officers could give the Irrigation Department information as to the best mode of treating such land and of making it, in perhaps a dozen years, bring in Rs. 2 to Rs. 3 per acre. If no change be made in the system, expenditure will annually increase, especially in Lower Sind, and year by year more uncertainty and insecurity will exist and demoralization leading to the abandonment of bunds, in some places perhaps owing to the erratic action of the river will ultimately set in. There is

no desire on the part of the writer to take too pessimistic a view of the state of things. It is scarcely correct however to take the optimistic view which some Engineers do who say "We are concerned with the present, let us leave the future to our great grand children to tackle," and again "Our returns show 11 per cent. on the capital outlay and this is good enough." But this is not the question. Is it or is it not necessary to look to the future? It is a hand-to-mouth, a short-sighted policy, which is at all times to be deprecated.

A Forest Administration is bound, as eloquently stated by Mr. Baden-Powell, to look to the future and see that the present generation of inhabitants does not endanger the existence of future generations by attacking the *Capital* when it is only entitled to the annual yield, and a similar politico-economic policy should actuate engineering efforts. What would posterity say if at the present juncture the Forest Department in order to show the highest returns, depleted the forests, leaving almost nothing, and a very difficult problem in the bargain to tackle for their successors? Surely this would be characterised as a very grave blunder? Yet this is almost exactly what the Irrigation Department in Sind, with all due deference to its officers, is unwittingly doing in regard to the embankment system, especially in Lower Sind. In their attempt to gain the highest revenue they are, as it were, killing the goose to get the golden eggs, *i. e.*, raising the bed level of the river and provoking erosion of the stream which leads to the washing away of very valuable land, the very land in fact which the embankment was specially erected to protect. Acres and acres of excellent kharif crop land and high seedling forest yielding Rs. 3 and Rs. 4 per acre which had been established for about a century, and on which improvements had been made, have disappeared in Upper Sind along the right bank within recent times and are now disappearing in Lower Sind, in this manner the bunds having provoked erosion.

No offence it is hoped will be taken at this plain and straightforward criticism—a criticism which is not made in any spirit of opposition, or hostility towards the officers of the Public Works Department, who, it is right to mention, are a very excellent and capable body of men, and no accusation of want of knowledge of their duties is insinuated. That criticism is to a certain extent excusable, however, may be judged from the opinion of one of the ablest Engineers in the Province (for whom the writer entertains the greatest respect) who has read most of this paper; but who does not however uphold the alignment proposed here, but says "I have always condemned the present alignment, but it has been *forced* on us: not *chosen* by us. If we had the choice, we should never have put it so close to the river bank.....The embanking of rivers is a question, is it worth doing so? If there is rich valuable land, which if protected, would yield a large return, then it is

worth doing so even though the result may be, judging from the experience of Mayence on the Rhine, a raising of the bed of the river." The same Engineer mentions that he has thrown the bund line back some miles in a certain locality ; but if this policy were generally followed by the Public Works Department, it would be better for the Province. On the contrary, in one or two places where the necessity for erecting bunds has arisen during the past three or four years, or even past year or two, they have been constructed *close* to the river bank as at Meanee near Hyderabad and at Khudee in the Shahbunder sub-division where the bund was swept away before it was completed, and several other instances could be given. What is required in Sind is a steady pursuance of a definitely stated and sanctioned principle which would have to be followed all over Sind and not the present system, which permits one Engineer to do what he thinks expedient in one district, and leaves another to act similarly in his own. Although the protective works in one district necessarily *must* have a very important influence and effect often on the protective works in the district lower down the river. The right hand in fact often does not know what the left hand is doing in regard to Engineering in Sind. Various large canals which are being built and which exist, will not in future realise the estimated revenue from them, because their mouths will be constantly shifting or silting up, or regulators especially in Central and Lower Sind costing thousands of rupees will be required to control the flow of water caused by the apparent high floods in the river each year, and the latter will themselves be subjected to damage and destruction. The Nareja Regulator on the Fuleli, for instance, which cost Rs. 28,000, was washed away in 1894, and annually, sluices in the embankments and the banks of canals are now being carried away.

The whole question it is submitted with all respect is not studied on the *geological footing* it deserves, and the outlook financially and especially politico-economically is becoming a serious one for the Province. According as the development of the present bund system has continued, so have the floods seemed higher and the more securely and successfully they are controlled or hemmed in, the higher will they become till, at length accidental breaches will cause widespread disaster. As evidence of the vast damage that can result from an accidental breach, instance the terrible disaster at Syzedin in Hungary on the Danube in 1879 when the town and its inhabitants were washed away.

Wherever embankments as *protective* works in other parts of the world, also such as in Japan have been erected, the conclusions arrived at after years of experience have been that it is almost safest to leave the river unembanked for the reason that the disasters resulting from heavy floods more than outweighed the benefits previously derived. From the account given by Mr. Vernon Harcourt in his Volume II of 'Rivers and Canals' of the protective

works in other countries this is apparent. It is not known whether the conditions elsewhere, especially in Japan, however, are exactly analagous to those in Sind ; but it is presumed they cannot be very different. Bearing in view the results as stated by Mr. Harcourt, however, without training works at the delta and high permanent masonry walls elsewhere hemming in the overflow closely in the manner effected in Sind, seems an obvious error.

In Lower Sind especially are the evils of close embanking more felt. The natural banks of the river not being rocky as between Bukkur and Rohri and the longitudinal fall of the country being less, the small scours which resulted at first by close embanking have now ceased and the elevation of land between the bunds resulting in the latter having to be heightened. Erosions are beginning to be felt. Breaches, also, owing to high floods, occur almost annually, and large areas such as Khinjar and Sonari Dhunds which were two sheets of water, and which gradually began to shrink and dry up and which had gradually escaped the reach of the river spills before the bunds were erected, have now commenced to receive outpourings from it and to form one large lake, for in 1894 in spite of embankments of about 20 or 25 feet high being erected to prevent lateral overflow, these lakes were flooded. Heavy rains in the hot weather of 1894 assisted to swell the waters of these lakes it is true, but the chief source of supply was the river which will, it is thought, almost annually cause both lakes to fill abnormally for some years. Measures such as are attempted to drain these sheets of water in the cold weather by cutting small channels from them to the rivers, may be likened to draining drops out of the ocean. The original source of the evil, the gradual elevation of the artificial sectional area of the river must be grappled with, and this can only be effected by permitting the stream to have as large a scope for its surplus water for expansion as possible.

If success in the matter of embanking under the *present policy* be desired, therefore works of *correction*, it is repeated, rather than works of *protection*, must be adopted, and bearing in view the resources of the Province which, as already remarked, prohibits their being undertaken, the most economical and most rational policy would seem to be to assist the river to dredge itself and add the mud to its banks as far as possible, and this can be done by adopting a fresh alignment as far back as the *Khandi forest belt*.

But while it is desirable to do this in the flat alluvial plains, one place in the Province exists where it is absolutely essential that the river should be closely embanked and treated as the Danube and that is between Kotri and Gidu, where unless vigorous corrective measures are taken, considerable damage to property at both these places from floods will later on occur.

A certain amount of scour between Kotri and Gidu used to take place formerly, but not sufficient to sweep an abnormal deposit of silt from the bed. Borings and observations taken

for the bridge across the Indus at Kotri show that the depth of sediment in the river bed at this spot before rock is reached is now about 100 feet, but evidence of this nature of the extent of deposit is scarcely required inasmuch as proof of the sectional area of the river, between the bunds not being permanent at Kotri, is observable from a comparison between the gauge readings at Bukkur and Kotri. When the gauges were first construc ted, a high reading at Bukkur was usually followed by a reading at Kotri proportionately high. This was before the development of the present embankment system ; but the same proportion is no longer maintained. There is a great divergence between the Bukkur and Kotri gauges now : Kotri is as it were outstripping Bukkur in the race. This can be accounted for by the fact that the tendency of the river between Bukkur and Rohri, is, as previously shown, to maintain a constant or even deeper channel, while the opposite tendency results at Kotri where the banks are not permanent.

In 1882 the Bukkur gauge read 17ft. 7in. and Kotri 20ft. 5½in. In 1891 Bukkur showed 14ft. 9in. and Kotri 20ft. 7in, a difference of abont 6ft. The present cold weather readings on the 23rd November 1895, are as follows :—

Bukkur 1ft. 5 in. or 11 inches *below* the average of the past ten years, and Kotri 7ft. 3in. or 1ft. 5in. *above* the average of the past ten years.

An examination of the plain below Hyderabad and Gidu shows it to be of alluvial origin, *i.e.*, it has been formed by repeated depositions of sediment caused by lateral overflows and changes of the river course in former times. The stream then, according to geological data must, at one period, when in flood, have spread its waters out as far as the limestone hills on which the cantonment and town of Hyderabad stand, and gradually by a process as described in the preceding pages, subsided within its present channel without practically any spill. The bed of the stream, however, had not become quite constant here, that is to say, the river had not entered its final stage, and this is obvious from the result of the borings now made, but still the process of scour had commenced and it seems clear that had the artificial bund system not interfered with the natural course of things, the natural scour would eventually have taken the river down to the rock, when danger from lateral overflows at Kotri and Gidu would have almost ceased.

But the extra amount of silt carried in the river owing to the protective works above Kotri has been swept down and deposited in the river channel below Kotri, causing there a sort of bar. This deposit has diminished the longitudinal full of the waters as they pass through Kotri, causing the river to become dammed up as it were near there, and unless very high and strong masonry walls be constructed between Kotri and Gidu, and unless *dredging* also be resorted to in later years danger from floods annually will

occur. The situation as affecting Hyderabad also is getting very serious, for it will in the inundation season be in constant danger of being almost cut off from Gidu by water.

But another evil is also present in consequence of the elevation of the sectional area of the river between the bunds near Kotri and Gidu which will have a disastrous effect on the lands higher up in the Hyderabad District later on. The longitudinal fall of the waters, as explained, having diminished at Kotri, a bar will commence to be formed above that place also, and the rise of the river bed may be expected to go on creeping higher and higher up stream gradually each year until the general level of the river in the Hyderabad District North of Hyderabad has so risen as to cause lateral overflows and erosion all along the left and right banks where they have not been known to occur for a very considerable time. North of Hyderabad along the left bank there were very heavy floods in 1893 for the first time in the memory of the oldest inhabitant.

A new chord line of rail is almost constructed along the left bank of the river from Hyderabad to Rohri in the belief of its immunity from floods but such belief, for the reasons given, will pro ably in a few years be quickly dispelled. Lateral overflows are bound, it is predicted, to occur and cause breaches in this line later on. The section of the stream above Jamsheo is already commencing to be widened and shoals are being left in the frontage of the riverain forests all of which are certain forerunners of the evils that must eventually arise.

From what the writer knows of the Province he is thoroughly convinced that the policy of throwing the bunds back in the manner explained could be followed with advantage, and that it would ultimately prove of immense benefit to the state. He does not wish to be misunderstood in his remarks. The fact of his being a Forest Officer and desiring the bunds thrown back bears the aspect at first sight of his suggesting such a heroic policy from motives of departmental interest; but such is not the case, although it is admitted, at first the forests will be benefitted by such a policy, because, of course, at present a number of forests are entirely shut off from the river and are suffering in consequence. Throwing the bunds further back and giving greater scope for the spread of the river waters means ultimate extinction of the forests because, as described, the tendency of the river under such a policy would be to heighten its own banks and gradually to fall within them and not cause spill. So that unless artificially treated, the forests would eventually became extinct. It is desired to draw attention to the *principle* on which the river acts naturally and to suggest that the operation of embanking should not in consequence of the paucity of funds for undertaking works of *correction*, run counter to this principle: that it should run in the direction of assisting the process of development which has briefly been

attempted to be explained. No offence it is repeated will be taken at these criticisms which are made in no hostile spirit against a very excellent and able body of public servants, the younger of whom it is only fair to say have not been long enough in the Province to acquire much knowledge of the Indus and have probably remained all their time in one District. Those Engineers moreover who have served for years in Sind have not been able to acquire much knowledge of it from observation because of their time having been spent mainly along canal banks and in making and clearing canals and erecting sluices and regulators. In fact two of the Engineers longest resident in Sind frankly admitted recently that they knew nothing yet of the causes which actuated the river's movements. Had some officer been appointed years ago—as it is believed one now is to be—specially to take observations of the river, the laws which govern its movements would probably now be better understood and grappled with.

That one who is not an Engineer should arrogate to himself the position of critic and should suggest a remedy for the present unsatisfactory condition of things (as unsatisfactory they must be termed in consequence of the almost annual interruption of Railway traffic and the extension of erosion of permanent forest and kharif crop lands) may be thought presumptuous and at first sight ridiculous: but the subject of the best method of embanking the river, as must be palpable, is not outside the pale of forestry. Moreover a Forest Officer's duties take him along the margin of the stream—and as he is constantly brought face to face with its vagaries and is repeatedly reminded of them by being called upon to settle kacha or accretion disputes, he is in probably a more advantageous position therefore to take observations and draw conclusions from the constant fluctuations that occur.

It is through the assistance of Forestry and Geology and not by a total disregard of these subjects that a proper understanding can be gained regarding the best treatment to give the river in the matter of embanking. The banks of the river must be allowed to grow gradually stable, naturally, by forests being allowed to form upon them as explained; and any process opposed to this principle, as the present embankment system undoubtedly is, must end in failure and disaster. It is not known whether the theory laid down in regard to the different stages of an inundation river have ever been propounded before: the writer has certainly neither seen nor heard of any such theory; he has drawn his conclusions entirely from personal observation of the river itself in Sind, and it is satisfactory to find that two of his *confrerès* in the Province, one alas! is now dead; who have spent most of their service in this part of the Presidency are able to corroborate the existence of the different belts of growth along the margin of the stream and the different water levels which they affect. The observations of growth are a *vital* element in proof of the assertion of the rise in the bed of the river,

i. e. the sectional area between the embankments. If the river overflowed its banks so heavily in the forests, years ago, as it does now, the particular classes of forests which fringe the river as they exist from near Kotri Allarakis upwards would never have come into existence. The lands would be in the stage of those lower down in the deltaic region where they are flat and marshy and where only the Tamarisk and other useless trees grow. Embanking as is now done in Sind therefore undoubtedly has raised the bed of the river, judging by charactristics of growth on the margin of the stream and that it provokes erosion also. *Cela va sans dire*, when the condition of things in Upper Sind especially is brought to light. Those Forest Officers who have served in Sind must remember how distant the old Aliwahan Bangalow near Sukkur was from the river and how secure the land on which it and the village of Aliwahan stood seemed from being eroded by the river. Yet the Bangalow and lands have all been swept away. Engineers repeat that these sweeps or inroads upon the banks which the river takes have been going on from time immemorial but geology and forestry however answer distinctly *no*.

In conclusion, it is only just to mention that the inundation season of 1895 was lower than the previous year's, but only a few inches below the highest on record, and Engineers would probably submit this as an argument against the theory of the continued annual rise of the water level owing to the river embankments; but one has only to consult meteorological reports to ascertain the real cause of the failure of the river In 1895 to reach a higher level than the previous year. Comparing the reports of the snow falls during the winter season of 1893-94 and 1894-95 the opinion of the Meteorological Office at Simla is as follows :—

"The data (for 1893-94) show that the snow fall was un-
'doubtedly considerable and probably above the average in Afghan-
'istan in the mouths of January and February and was larger in
'amount than in the previous winter * * * * The snowfall
'was undoubtedly excessive in the higher Ranges of the Kashmir
'and Punjab Himalayas and was abnormally heavy in Ladakh
'where it was in the opinion of the natives of the district unprece-
'dented."—

It is hence almost certain that there has been less snow during the past winter (1894-95) in Persia, Beluchistan, Afghanistan, and probably Turkistan, Thibet and Central Asia and that the winter ceased usually early and was very mild. The snow fall for the past season was heaviest in the Kashmir and Punjab Himalayas, and was undoubtedly much heavier than usual in December and January. It was very heavy in the interior ranges but the heavy snowfall did not extend in the upper Indus Valley and the Karakorum Ranges as in did in 1894. This is further confirmed by the fact that no snow fell at Kashgar during the season and that the fall at Leh was very small." These extracts exhibit the

combination of heavy to excessive snowfalls during the winter 1893-94 while the snowfall in 1894-95 was smaller than in the previous year. Although the snowfall during 1893-94 was excessive, it appears not to have been more so, however than in 1867-68 1877-78, 1882-83, 1884-85, 1888-89, 1890-91, 1892-93 (*vide* Meteorological reports for 1894-95).

Yet during the inundation period of 1894 the floods in Sind were the highest on record: bunds were breached in every direction, Railway traffic was impeded for a considerable time and the town of Kotri was submerged. The snowfall during 1894-95 being smaller generally than in 1893-94 accounted therefore for a lower inundation in the flood season of 1895 than in the previous year. The gauge readings in November 1895 at Kotri were higher than those of last year, but it does not follow at all that the flood will be higher in the Summer of 1896 than during the previous inundation. To accurately estimate what sort of flood may be expected therefore it will be necessary to consult meteorological reports in order to ascertain the snowfalls of the current winter.

The river Indus for its continued and steady rise does not subsist on rainfalls at all, but on snowfalls at or near its sources and those of its five tributaries. Heavy rain in the Punjab may cause a temporary flush in the hot weather but for a persistent steady high flood, as there was in 1894, snowfalls undoubtedly form *the* important factor.

G. M. R.

3rd February, 1896.

The Indian Forest Department and Coopers Hill.

In our number for December 1895, an article on the "Recruitment of Officers for the Indian Forest Service" appeared under the initials "C. G. R." In that article it was said: "The 'position of the Inspector-General of Forests is analogous to that 'of a Chief Engineer, while Conservators of Forests correspond to 'Superintending Engineers of the Public Works organisation, 'so that if, as stated in the regulations under consideration 'the 'Forest Officers are on an equality with Public Works Officers ap-'pointed from Coopers Hill' then it must be the intention of the 'India Office to extend to Conservators of Forests, the Rs. 1,000 a 'year extra pension that has already been accorded to Superin-'tending Engineers, and we hope that the Indian Government will 'recognise this and make the necessary alterations in the present 'pension rules of the department at once" and we then drew the attention of our readers to an extract from the *Indian Engineer*, which we reprinted at pages 480 and 481, in which it was suggested that candidates for the Forest Department of India ought to know that the Coopers Hill prospectus does not fairly explain the conditions of service.

We have now received the following letter from England, which we give in full :—

"On page 480 of the *Indian Forester* for December 1895, it is said 'that in the Forest prospectus of Coopers Hill for December 1895, mis-'statements are made as to the rules that 'regulate the pensions of the 'superior grades of that department and of the Public Works and Tele-'graphs' and that the statement that as regards pensions 'the Forest 'Officers appointed from England are thus placed on an equality with 'Public Works Officers appointed from Coopers Hill is incorrect and 'misleading."

"This criticism overlooks the fact that the concession granted for 'special reasons, whereby Chief Engineers were eligible for an additional 'pension of Rs. 2,000, was withdrawn by Lord Kimberley's despatch of '21st September 1893, and that under the operation of that despatch, 'from the end of 1893, the same orders govern the award of pensions to 'recruits thereafter entering from Coopers Hill College, either the Public 'Works, the Telegraph, or the Forest Department.

"So long as these orders last, the selected forest candidates of 1894 'and subsequent years undoubtedly enjoy the same pension rules as their 'contemporaries in the Public Works Department."

A. T.

It is thus claimed by our correspondent that we were wrong in our article of December last, and that the *Indian Engineer* was wrong, and that the recruits from the Coopers Hill College who have entered the service since 1893, whether in the Public Works, Telegraph or Forest Departments, are really all on an equality as regards special pensions. He says that in that year the special additional pensions of Rs. 2.000 allowed by S. 714 of the Civil Service Regulations to Chief Engineers of the Public Works Department, and the Director-General and Deputy Director-General of Telegraphs, were withdrawn by a despatch of the Secretary of State, but he is probably unaware that there is no mention of that despatch in the Civil Service Regulations, and that in the 2½ years that have elapsed since the despatch referred to, Sections 714 to 716 have not been altered.

A reference to our copy of the "Civil Service Regulations," a copy which is very carefully corrected as Addenda—Corrigenda slips are issued, shows that S. 714 runs as follows :—

"714. The following special additional pensions, over and above 'these allowed in Article 712, may be allowed by the Government of India 'as rewards of approved service in the responsible positions referred to 'below :—

(*a*) *Additional pension of Rs. 2,000 per annum to those who have served three years as*—

(i) Chief Engineers, or officers who may have been graded as such.

(ii) Director-General, or Deputy Director-General of Telegraphs.

'(*b*) *Additional pensions of Rs. 1,000 per annum to those who have 'served three years as*—

(i) Superintending Engineers.

(ii) Director of Construction; Director of Traffic or Superintendent, '1st grade, in the Indian Telegraph Department,

(iii) Directors of the Persian and Persian Gulf Telegraphs in the 'Indo-European Telegraph Department, &c., &c., &c."

The Coopers Hill prospectus runs thus :—

"The more favourable pension rules have recently been extended 'to Forest Officers appointed from England, who are thus placed on an 'equality with Public Works Officers appointed from Coopers Hill College. 'Any Forest Officer who has rendered not less than three years' approv-'ed service as Head of his Department, has also been made eligible for an 'extra pension of Rs. 1,000 per annum."

These were the statements which, when our December number issued, contrasted the position of Forest Officers as regards special pensions with those of Public Works and Telegraph men. What the Secretary of State exactly meant by "Head of his Department" requires more definite interpretation no doubt, but there can be no question but that the Inspector-General of Forests is the head of the Forest Department in the Bengal Presidency, and that the Conservators of Forests under the various Local Governments and Administrations have always been reckoned as Heads of Department in their Provinces, whether there have been one only or more than one Circle in those Provinces. The Inspector-General of Forests (pay Rs. 2,000, rising to Rs. 2,500) is on an equality as regards pay and position, with Chief Engineers or the Director-General of Telegraphs, and Conservators of Forests (pay Rs. 1,100 to Rs. 1,600) are on an equality with Superintending Engineers, whose rates of pay are the same. Consequently, if the Forest Rules are the same as the Public Works and Telegraph Rules, the Inspector-General would be eligible for the additional pension of Rs. 2,000, and Conservators of Forests for that of Rs. 1,000, but the Coopers Hill prospectus does not give us this, and therefore we consider that our correspondent's statement and the statement of the *Indian Engineer* were quite accurately representing the facts the writers had available before them when they wrote as they did.

Since our December number issued, we have received a copy of the Secretary of State's despatch No. 230 of December 26th, 1896, and copy of it was issued as page 103*a* of our March number. That despatch refers to the one No. 188 of September 21st, 1893, which our correspondent alludes to, but does not give the substance of its order, so that as far as we Forest Officers in India are concerned, we are still officially ignorant of it. It would seem probable that even Public Works Officers are ignorant of it, for it is hardly likely that an alteration of the Rules which withdraws from Chief Engineers what must be one of their most important privileges, would escape the comments of the press and be allowed to pass without protest by the department. We do not remember to have seen any press allusion to the subject.

Turning to the new orders of the Secretary of State in the despatch of December 26th, they run as follows : "The Forest 'Officers, whether at present in your service, or hereafter to be ap-

'pointed, will be entitled, if recommended for special merit, to an 'extra pension of Rs. 1,000 per annum after three years of approv- 'ed service as the Head of the Department in any Province." Assuming that this cuts out the Inspector-General altogether from his expected Rs. 2,000, which in itself would be a shame, it is at any rate satisfactory to note that in this case it is the "Head of Department *in any Province*" who is to get the concession. This can only mean that, at any rate, *some* Conservators will be eligible, and most probably *all*, for it can hardly be intended that a 3rd grade Conservator in Berar or Assam is to get a special pension which is denied to a 1st grade man in Burma or Bombay, where there is more than one Head of Department.

With every possible respect to our correspondent, who we think has himself been misled, we are bound to say that until definite clear orders are issued and inserted in the Civil Service Regulations, naming together the Public Works, Telegraph and Forest Departments, we shall still claim that the Coopers Hill prospectus is misleading, and that the statement that Forest Officers are on an equality with those of the Public Works is not borne out by the official orders of the Government in India. We will conclude our remarks by a quotation from the *Pioneer* of the 2nd November 1895, which will shew our correspondent that the *Indian Engineer* and the *Indian Forester* were not alone in their opinions on the subject. It is a great pity that the enthusiasm of the officers of a hardworking department should be checked, and a sense of injustice be fostered for the sake of the miserable saving effected by the refusal to allow what they have been given to understand they may expect as a right. It is a pity that it should take so long to induce the Secretary of State (the Government of India itself has supported us as the despatch shews clearly) to grant the concessions which we have fairly claimed, and that his refusal should have been conveyed in such curt language as that of Lord George Hamilton's despatch. It took us something like 15 years to get the Public Works pension rules extended to ourselves, and it may take as many more to get the special pensions extended, especially if, as would seem not unlikely, Public Works Officers are not content to abide by the orders of 1893, which the Government of India have apparently not yet been able to insert in the Regulations.

"The usual Coopers Hill prospectus for the Indian Forest Service 'examinations has just been issued. It contains nothing new, but it is 'again repeated in paragraph 17 that 'the more favourable pension 'rules have recently been extended to Forest Officers appointed from 'England, who are thus placed on an equality with Public Works Officers 'appointed from Coopers Hill; any Forest Officer who has rendered not 'less than three years' approved service as Head of his Department, has 'also been made eligible for an extra pension of Rs. 1,000 per annum.' 'This is a most misleading statement, for although Article 712 with its 'scale of pensions has been extended, Article 714, under which Chief

'Engineers and certain Telegraph officers are eligible for Rs. 2,000 'extra, and all Superintending Engineers for Rs. 1,000 extra, has not 'been extended to the Forest Department. In short, under the exist- 'ing orders, only the Inspector-General is eligible as the Head of his 'Department for an additional pension of Rs. 1,000. The Government 'of India have for years in numerous despatches recommended that for 'purposes of the extra pensions under Article 714, the Inspector-General 'of Forests should be classed as a Chief Engineer, and Conservators of 'the 1st and 2nd grades as Superintending Engineers. It rests with 'the Secretary of State to sanction these proposals and to place Forest 'Officers on an equality with their fellows in the Public Works Depart- 'ment as is now incorrectly said in the Coopers Hill prospectus to have 'been done. As the matter stands, it might be understood from that 'prospectus that all Conservators of the 1st, 2nd and 3rd grades would 'rank as Heads of the Department and qualify in the same way as Super- 'intending Engineers for the additional Rs. 1,000; and it is not 'unlikely that some day the Government may find it difficult to disqualify 'retiring 3rd grade Conservators for the extra pension. As a matter of 'fact the number of Conservators of the 1st and 2nd grades, bearing ap- 'proximately the same proportion to the department as Superintending 'Engineers do to that of the P. W. D., the desired equality in pension 'prospects is arrived at by making the concession only to those two 'grades and not to Conservators of the 3rd grade. The position is 'about as unsatisfactory as can be, and candidates for the Forest Service 'should know that the Coopers Hill prospectus does not fairly explain 'matters."—(*Pioneer*, November 2nd, 1895).

II.—CORRESPONDENCE.

Fire-protection in Fields and Forests.

SIR,

In a recent review on Forest Administration in British India, the Inspector-General in attempting to explain the causes which tend to endanger the successful protection of the forests from fire, lays stress on the prevalence in most parts of India and Burma of the practice of burning over the ground either of the forests themselves for the purposes of improving the grazing; or of lands adjoining the Government forests as in bewar, or dhaya, or barra cultivation.

It is curious to find that this practice of burning over the ground is apparently of the greatest antiquity. Virgil, himself, refers to it when he sings :—

"Long practice has a sure improvement found,
With kindled fires to burn the barren ground.
When the light stubble, to the flames resigned,
Is driven along, and crackles in the wind."

The poet, however, goes sadly astray in his speculations about the possible way in which this burning is beneficial; as, whether the "hollow womb of the earth is warmed by it," or some "latent vice is cured," or redundant humours "driven off, or that new breathings" are opened in the chapt earth, or the reverse :—

"That the heat the gaping ground constrains,
New knits the surface, and new strings the veins;
Lest soaking showers should pierce her secret seat,
Or freezing Boreas chill her genial heat,
Or scorching suns too violently beat, &c."

Whilst dwelling upon this subject it is interesting, on the other hand, to find how stringent were the rules made and enforced in the old days, to protect the standing crops from fire. Moses says :— "If fire break out and catch in thorns, so that the stacks of corn, or the standing corn, or the field be consumed therewith, he that kindled the fire shall surely make restitution."

Again, Burckhardt, in his travels in Palestine, after mentioning how his guide was constantly reproving him for the careless manner in which he threw away the ashes from his pipe, goes on to say: "The Arabs who inhabit the valley of the Jordan invariably *put to death* any person who is known to have been even the innocent cause of firing the grass; and they have made it a public law among themselves, that, even in the height of intestine warfare, no one shall attempt to set his enemy's harvest on fire."

The same care and precaution in the protection of the standing crops from fire is exercised in the present day, by the people themselves, in the Nerbudda Valley, the granary of India. A few years back, whilst camping in the Hoshangabad District, with the Forest Officer of that Division, I was greatly struck at the forcible and logical manner in which he impressed the people with the necessity *and possibility* of protecting the Government forests by pointing to their wheat fields. "Just as it is possible for you," he would exclaim, "to travel through wheat fields without endangering their 'safety by smoking or fire, so it is possible for you to pass through 'the Government forests." Indeed, if any one had at any time attempted to endanger the safety of the standing crops by smoking, or the careless use of fire, he would have fared badly at the hands of the people. This every one already thoroughly well understood; but, that Government forests should demand the same protection had not previously struck them.

"A. C."

A Disease of the Mahua Tree (Bassia Latifolia).

SIR,

In Western Rajputana the tree grows well in low places of the Arwali Range, but when it is forced to grow in the plains, it grows fairly well for 10 to 12 years. On elapse of the above period, it commences to exude a white sticky sap which flows down

along the trunk and adheres to the bark. When the whole bark is covered with the sap, the tree commences to die. I shall be very thankful if any correspondent of the *Indian Forester* will let me know the remedy for the above disease through the medium of the magazine.

JO HUKAM.

Turpentine in America and in India.

SIR,

I beg to forward an interesting article taken from Chambers' Journal regarding pine tapping in the State of Georgia, together with the following remarks on the system there practiced, as compared with the methods employed in France and lately introduced into the Himalayas.

As far as I can make out, the so-called box system seems to be very similar to the old wasteful native method carried on in these hills, but pushed to a much more deadly extent and the stems of the trees are apparently converted into a kind of ladder, the notches or boxes being cut one above the other up to a considerable height.

One would have thought that in a fairly advanced country as we may suppose Georgia to be, a more scientific method would have been long ago introduced, but this does not seem to have been the case, at least till quite recently.

If the earthen pans referred to are anything like the small pots used in the Landes and in Jaunsar, the new system will doubtless assure the maintenance of these forests, whereas the old system apparently causes the complete extinction of all the trees tapped.

It may be here mentioned that the system of Chir tapping as practiced in Jaunsar causes no appreciable damage to the trees even though they are tapped in two or three places up to a height of about six feet and after 4 or 5 seers of crude resin on an average have been extracted from them.

It may be noted that this kind of work in Georgia does not seem to be at all popular, and that the danger from fire is even greater than in the Landes and in the Himalayas.

E. McA. M.

A Turpentine Farm in Georgia.

Although we have heard much about the Far West, perhaps the wildest life in the States may be seen in the vast pine forests of Georgia. Here and there, dotted in amongst the great expanse of trees, are the turpentine farms and the saw mills. At the latter, where the machinery turns to the tune of the fast-flowing river, life is comparatively civilised; but amongst the turpentine farms, life is of the wildest. There is certainly no solitary shepherding or

cattle-driving to do, but the loneliness in the wilderness of trees is perhaps even greater than on the rolling prairies. Trees, trees everywhere, on upland and lowland, whichever way we look. The melancholy sough of the wind through the branches, and the rich terebene smell of the pines, follow us everywhere, whilst at the foot of the trees the red ants build their cities of dead pine spicules. Only yellow pine on the uplands and rosemary pine beneath, until the monotony makes us feel that the whole universe must consist of nothing but pine-trees.

When a prospector makes up his mind to start a turpentine farm, according to the *Naval Stores Review*, he first of all selects a patch of forest that has not been worked, and either buys the land or leases it from the State. Then he has a clearing made, and proceeds to erect his still and to get quarters ready for his workmen. The housing accommodation consists of a number of two-roomed cottages built of rough timber and roofed with boards or shingles. The prospector's great endeavour is to place his head-quarters so that they are near the railway or the river on the one hand, and conveniently situated for bringing the raw material to the still, on the other. When all is ready, the adventurer's real trouble begins with the selection of his woodmen or overseers. After these are selected they are sent out all over the State to engage workmen. Labour is scarce in Georgia, and it usually happens that the overseers have to scour two or three of the neighbouring States before they can secure a sufficient number of competent labourers. As may be imagined, much responsibility rests upon the shoulders of the overseers, for upon their good judgment in securing industrious steady men the whole success of the venture depends. When the labourers have been engaged, the dangerous task of burning the grass and rubbish commences. As a preliminary, the grass and everything combustible is cleared away carefully from the roots of every tree, and a large patch is cleared round the edges of the prospector's section, so as to prevent the fire from spreading to the rest of the forest. As soon as sufficient clearance has been made, the grass is fired and allowed to burn itself out. In spite of all precautions, the forest catches fire sometimes; a large proportion of the trees are destroyed, as well as the settlement itself, perhaps; and the prospector has to seek pastures new as a broken man. The fire, if it does not get out of hand, clears the ground of rubbish, so that cartage is easier, and the forest is rendered tolerably safe from accidental fires in the future—a vital consideration. The next thing to do is to run 'drifts,' as they are called, through the forest. This operation consists in removing strips of bark from the trees in long parallel lines running right through the section of forest, and the trees are now ready for boxing. This is the most important proceeding of all. The hands, mostly negroes, are divided into squads, and over each is set a white superintendent and a tallyman, also white as a rule. Each man is provided with a boxing

axe, and all work regularly along the drift. The 'box' is an incision in the tree about twelve inches wide, by seven inches deep and three inches high. If the men are not watched carefully, they will cut the boxes too wide or too deep, and if this is done, the trees are destroyed very rapidly. The box is levelled to prevent the 'gum,' which begins to run as soon as the box is cut, from overflowing. The contents are removed every day by dippers, and conveyed in buckets to barrels, which are taken on wagons to the still when full. As soon as the wound in the tree heals, it has to be opened again by cutting away the bark above the box and making a fresh streak. The whole process is very destructive to the trees, which are killed in a few years by the boxing process. Before many years are passed, the pine forests will be ruined if the present system is allowed to go on. Fortunately, an earthenware pan has been invented, which fits close against the tree, and takes the place of the box as a receptacle for the gum; this should diminish the evil to some extent. Already, a law has been passed by the State to limit the cutting of boxes to the winter months, and so minimise the evil.

The crude gum consists principally of a mixture of resin and turpentine, which are separated by distillation. It is a simple process, although requiring care and experience. The gum is boiled in a large iron 'kettle' or still, water being added from time to time; the spirits of turpentine pass over with the steam, and are condensed in a worm surrounded with cold water, the turpentine being skimmed off the top of the condensed water with a ladle. The resin is left behind in the still, and is run out into barrels at intervals. The lightest coloured resin is obtained from the virgin boxes, and fetches the highest price; the lowest quality is that scraped from the boxes when they are allowed to run dry in October. The process of hacking and chipping the tree continues up to this period, the boxes being extended until they are twelve or even fifteen feet high. Each labourer is given a definite number of trees to chip, and generally manages to do the whole of his work by the end of Wednesday, spending the rest of the week in idleness. The white woodman or inspector looks after six or eight of these sections, going his rounds on horseback.

Although large sums of money are made at turpentine farming, the adventurer is in a constant state of anxiety. There is always the terrible danger of fire breaking out at any moment. With all the resin and turpentine about, the whole place becomes a sea of flames in a moment, should a fire once start. Besides this risk, there is continual trouble with the hands, who desert on the slightest pretext, and the farmer is ruined more frequently by the desertion of his labourers than by fire. In the case of the white overseers, the work of riding round in the forest day after

day, bossing black labourers, without any refining influences, is dreary and demoralising. In the Far West things are not nearly so bad, for on the prairies a man may be lonely, and the cowboy society may be of a very low order; but there is not the eternal weariness of the pine forest, and there is no nigger-driving.

Casuarina on Sand-dunes.

Casuarina may be seen growing with its toes in the sea, more or less all down the coast from Damaun to Ceylon, and I do not think anybody need worry about deposits of salt and sand on the plants. I was myself concerned in planting Casuarina on the dunes just above high tide, some little distance south of the place referred to by Mr. Wallinger, and found no difficulty whatever, but of course I did not expect all the plants to survive, and did expect that many would do badly, if carelessly transplanted, or damaged by rats. Root-injury, through either cause, was the enemy.

VELLEDA.

Medicines in Pills for Forest use.

DEAR SIR,

I think all Forest Officers will be glad to know that the Army and Navy Stores, Bombay, get out from home supplies of medicine in pill form specially suitable for the Indian forests. The pills keep well, are easily taken and are *very* cheap. All your readers will be glad to hear the Stores at Bombay are at work again in new quarters.

C. BAGSHAWE.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Forests in the Telbal Valley, Kashmir.

This valley is situated a few miles to the north-east of the city of Srínagar, and is traversed by the Ara River, which has its origin in a lake known as Mar Sar, and flowing in a westerly direction, runs into the Dal Lake near Shálimár Garden. The river at its highest has a considerable volume of water and is capable of carrying small sized logs. The construction of the dam for the water supply of Srínagar at the village of Harwan above Shálimár will, however, necessitate special arrangements for floating: at present nothing but firewood is brought out in small pieces. As usual, the hillsides on the right bank of the river, having a southerly

aspect, are bare of trees, though valuable as grazing grounds, and from the great extent of pasture land there will be no hardship in limiting the village grazing to this side of the valley, while the young forests on the left bank are allowed rest. All forest growth is confined to the hillsides above the left bank of the river Ara, and generally consists almost entirely of broad leaved species, such as wild fruit trees, *Parrotia*, hawthorn, *Cotoneaster* and other shrubs with some poplar in the lower part of the valley. In the higher elevations there is some growth of inferior pines, but deodar does not occur, except as isolated trees here and there. Further up the valley towards the village of Dachigam, horse-chestnut, maple, &c., are found; the shrubby undergrowth comprises the usual species such as rose, *Viburnum*, *Lonicera*, raspberry, *Staphylea*, *Spiræa*, barberry, and so on. Above Harwan there are five villages known collectively as Panzgram, individually they are Tropher, Babgam, Nagpura, Wanpura and Draphama.

Above these villages up the valley is Kaopura, which was formerly called a rakh or place, where State cattle were kept. Further up again stands Dachigam, the last village on this stream, though there are some small Gujar hamlets adjoining the lands of the village. Between Harwan and Kaopura the forest growth is little better than scrub jungle, but if closed to felling it will rapidly improve. The really good forest begins from Kaopura, and extends up to Dachigam along the left bank of the stream. At Kaopura a nala joins the Ara River, containing a very dense forest of hard woods which shows no signs of felling in the past, probably because it was further away from the river than the forest higher up the valley.

Immediately above Kaopura on the main stream is the first place where trees have been felled for firewood for Srínagar supply. The forest here descends quite to the water's edge, so this place was naturally chosen as giving the least trouble in extraction of the produce, and just as naturally every tree has been cut in the area operated on, indeed the general look is that of a fire swept blank, and what is worse, for some reason, the poh (*Parrotia*) has not coppiced after felling. High above this near the crest of the range is a small forest of budlu and ré (*Abies Webbiana* and *Smithiana*) with a few kairu intermixed and even an isolated deodar here and there.

Opposite Dachigam to the south is a nala known as Sundar Nár: this contains very thick forest, mostly of hard woods; but at a higher elevation there are conifers, and among them a few deodar. About half the area in this side valley consists of grassy blanks. No fellings have yet been made here. To the south-east of Dachigam is the large nala, called Nawan Nár, which joins the Ara River at the lime quarries: these appear to have only lately been discovered, and are now being worked for the dam at Harwan; the limestone seems to be of excellent

quality, and as Dachigam is only four or five miles from Harwan along an easy road delivery should be very inexpensive. The Nawan Nár contains very good hardwood forest, especially in the higher elevations, but the eastern slopes on its left bank have many grassy blanks; the head of the valley is well covered with forest. The slopes on the right bank with a southern aspect are as usual quite bare of tree or shrub vegetation, but are useful as grazing grounds for the village, and there will be no hardship in closing portions of the forest clad slopes on the left bank. There is not much forest of any value any distance above Dachigam up the main stream of the Ara River; on the left bank where the slopes have a northern aspect, the forest is good for a mile or so, but after that it becomes poor and the hillsides very precipitous, having only a few conifers here and there.

In short, in the Telbal, or, as it is also called the Dachigam Valley, the forest growth is confined to the left bank of the Ara River, and even there the slopes facing the east are grassy blanks, while at the lower end of the valley the summit of the range is also bare of trees; the area under forest is therefore not very extensive, but being so close to Srínagar it is of the greatest value for the supply of firewood, and, perhaps, in time it may be possible to extract pine timber in short lengths, but not at present prices. Hitherto the felling has been confined to the tract lying beiween Kaopura and a point about a mile above Dachigam, and for firewood alone trees of all sizes have been felled, though probably none of them exceeded two feet in girth; every part of the tree was extracted, except the smaller branches. The firewood is usually cut into what are known as *hatbas* or pieces about 18" to 24" in length, though in the case of the thicker pieces these were brought out as long as four feet. The wood is cut into pieces one year and left to dry in the forest till next year, it is then thrown into the river, and partly floating, partly rolling along by the great force of the stream is carried down to what is known as the *ghât* near Shálimár; here it is caught and collected on the bank and finally taken in boats to the city by way of the Dal Lake.

As regards the question of grazing it is a very simple one, there are very few villages, the whole of the slopes on the right bank of the Ara River are grassy blanks; the area is more than sufficient for many more cattle than the villagers possess; the valley is a narrow one, so that these slopes are quite close to the villages, at any rate such as are situated above Harwan, there would, therefore, be no hardship whatever in closing the whole of the forest clad area on the left bank if it were considered advisable, much less therefore in closing a part; this is especially the case at Dachigam where, owing to the large area left undemarcated, there is not the smallest necessity for cattle going into the forest.

The forest area in the lowest part of the valley just above the water-works dam up to Draphama ought to be strictly closed to all grazing, though it might be allowed in the grassy blanks near the crest of the ridges. Closing is necessary, both in order to allow the forest to recover past bad usage and also in the interests of the water supply. On the whole, forest matters are very hopeful in this valley, the growth is good, the fellings have been hitherto comparatively small, so that considering its proximity to the city the tract is very valuable for the firewood supply.

It is said that the Nakshbandi Jagirdar, who lives on the other side of the range on the shore of the Dal Lake at Brain, has cultivated a plot of land in the Ara Valley high above the village of Kaopura ; if so, he should be ousted from it or he will make some claims on the forests.

The village houses in this valley are built of sundried bricks, double-storied, with a balcony ; very little wood is used. Here there is no necessity for *pine* wood being given for building ; the poh (*Parrotia*) grows to a very large size, and being a hard wood, it is just as durable as pine and nearer to hand than the conifers.

The lower boundary of the forests in this valley was completely demarcated by the Conservator in person during the spring of 1894 ; this will at any rate save them from being damaged or broken up for cultivation; as soon as possible the demarcation should be completed and a boundary survey made.

J. C. McDONELL,
Conservator of Forests,
Jammu and Kashmir State.

IV.-REVIEWS.

The Ceylon Forest Administration Report 1894.

Last year, in our April number, we reviewed the report for 1893. The present report is as interesting a one as its predecessors. Mr. A. F. Broun was Conservator during the year.

Only two square miles were added during the year to the area of reserved forests, but there are no less than 254 square miles under settlement, and ready, or nearly ready, for proclamation.

We are glad to see that attention is being paid to the palmyra forests in the north of the island, and that an officer, Mr. Hansard, has been employed in roughly surveying the crown lands in the Jaffna District which bear palmyra or are fit for planting with it. He has reported that large quantities of palmyra wood are being exported to India, and this seems to point to the importance of enquiries being also made in the neighbouring Indian Districts,

such as Madura, Tanjore and Tinnevelly, with a view to making palmyra reserves or plantations there, also. In same districts in Madras, *e.g.*, Nellore, palmyra areas have, we believe, been reserved; and in others, *e.g.*, Cuddapah and Anantapur, palmyra plantations have been made, we understand, but we have not heard of any in the Southern Districts having yet been formed. Nothing is more easy in the way of plantation than to grow palmyra, all that is necessary is to sow the large fruits which germinate well and then to keep off cattle. We note that Mr. Broun gives 80 years as the time necessary to produce timber-yielding palmyras.

Fire-protection in Ceylon seems to be still rather in abeyance, but the teak plantations were successfully protected during the year.

A great deal of plantation work is going on in all districts, but it seems to be more or less of a desultory character. The Puttalam teak plantation covers 58½ acres, and the oldest trees which were 14 years old, shew an average girth of nearly 2 feet. In Sabaragamuwa are plantations of Para rubber which grows fast, the mean annual girth increment being from 4 to 5 inches. In the hills Eucalyptus is being grown, the chief species being *E. robusta*.

The financial results of the year shew a considerable deficit—they are :—

			Rs.
Revenue	...	...	3,84,536
Expenditure	...	.	4,56,568
Deficit	...	...	72,032

Report on the Nagpur Experimental Farm for 1894-95.

Last year we referred to the 1893-94 report of this farm in our Review at p. 236 of vol. XXI, and drew the attention of our readers to the little experiment in practical forestry which the Central Provinces' Agricultural Department had undertaken in the Telinkheri Fuel and Fodder Reserve. We then pointed out how they were experiencing the difficulties which we, as Forest Officers, have constantly found, in trying to re-clothe unpromising areas under the difficulties of unrestrained grazing in unfenced lands and with insufficient punishment to offenders. This year, there is a similar record, and Mr. R. S. Joshi says :—

"The reserves are watched by two chowkidars, but with all 'their watchfulness, stray cattle enter the reserves and destroy 'numerous saplings. Last year the owners of cattle that had 'trespassed into the reserves were fined by the District Magistrate; 'but as the smallness of the fines had no deterrent effect, the 'District Magistrate recently imposed a heavier fine on the owners 'of the cattle who had allowed their cattle to stray into the

'reserves, and it is hoped that they will not offend in this respect 'again. With a view to protect the reserve from stray cattle, an 'area of about 10 acres has been fenced in with prickly pear."

In his Review, Mr. Carey, the Commissioner of Agriculture says: "It has been recognized that no great success can be 'attained until the area is fenced in," with this we fully agree, though we do not think that cactus is a good fencing material; and if we might be permitted to offer a suggestion, it is that the fencing should be done first and the land allowed to remain for a while ungrazed and permitted to grow only grass with such bushes and trees as may come up of themselves. When once a certain amount of growth has started and the soil has been improved by the detritus of the grass and bushes, it will be easier to introduce trees by sowing or planting than it appears to be now.

The rest of the report is good and interesting though of course more so to the practical Agriculturist than to the Forester. The records of experiments, with manures are clearly and concisely shown, and it is interesting to note that the 'Bawacho' plant *Psoralea corylifolia* is largely used as a green manure being expected, from its being a leguminous plant, to improve the supply of nitrogen available for the crops. Experiments have also been started to see whether something cannot be done to combat the wheat rust (*Puccinia Rubigo-vera*) which does such serious damage. So far the experiments do not seem to have been very conclusive, but we hope they will be continued and result in a remedy being soon discovered.

V.—SHIKAR AND TRAVEL.

The Brow-antlered Deer or Manipur Stag (Cervus Eldi).

This deer is not found in India proper and a short account of the habits, &c., of the animal may therefore be of interest to some of your readers in India and elsewhere.

The *Cervus Eldi* or Eld's deer, so called after Captain Eld who discovered the species in 1838, is known in Burma as the Thamin and Sangnai or Sangrai in Manipur. In size, the stag stands nearly 12 hands at the shoulder, the doe being a few inches smaller. In its winter coat, this deer presents quite a different appearance to what it is as seen in the summer months, and this has led some sportsmen to think there are two varieties of this deer in Burma. In its summer coat, that is from spring to autumn, this deer is known as the Thamin-wan (Wan=yellow) to the Burmese, at the end of autumn it changes its coat to a

dark brown and becomes, especially the buck, a much more shaggy looking beast, and it is then known as the Thamin-wet (Wet = pig). I have never shot nor heard of any one else shooting a yellow stag in December or a brown one in June. In summer, the hair is short, of a dun colour spotted white, like a Cheetal (*C. axis*). The Thamin of Lower Burma is said not to be spotted except fawns. This is not so in Upper Burma, and the white spots are very distinct in all ages during summer; and even in its winter coat, with the light at the proper angle, the spots can be made out. The following are the measurements of the largest specimen shot by me in Upper Burma, and the head now adorns the walls of the Dehra Dún Forest School Museum.

Horns, brow 14 ins. beam 38½	= 52·5 inches.
Greatest divergence	= 25 inches.
Circumference above burr	= 7 inches.
Nose to end of tail	= 45 inches.
Girth at shoulder	= 43 inches.
Weight (uncleaned)	= 270 lbs.

Below are the measurements of a few good heads:—

	I	II	III	IV
Right horn, tip to tip,	50 ins,	49 ins.	46 ins.	49 inches.
Left „ „ „	51 ins.	49 ins.	46 ins.	47½ inches.
Greatest divergence	33 ins.	29 ins.	27 ins.	28 inches.
Circumference above burr	5 ins.	5½ ins.	4½ ins.	6 inches.

The Thamin horns in Lower Burma have a much greater divergence than heads procured in Upper Burma.

The brow-antlers are of course the most peculiar feature of this deer, being very prominent, they are scimitar shaped, projecting forwards, slightly inwards, then downwards, and finally upwards. The main beam has generally only one bifurcation, though at times abnormally developed heads are met with. The Tres-tine, as is the case with the Cheetal (*C. axis*) and the Hog-deer (*C. porcinus*) is developed at the expense of the Royal, which in many heads is only a snag. There are frequently points on the upper surface of the brow-antler and generally one or two prominent snags in the axil, the main beam is unbranched for two-thirds its length and is curved backwards, then outwards, and lastly forwards; towards the end it bears a number of small points varying from 3 to 10. The greatest number of points in a head, which I have heard of, is 18, but a great many of these are merely snags and can hardly be called points. For example seven or eight of them would not suspend a wine-glass, which is the method adopted in counting the points in the head of the Red-deer of Europe.

The Thamin is distributed over the valley of Manipur and thence southwards in suitable localities throughout Burma and the Malay Peninsula; always in flat alluvial ground. In Lower

Burma the Thamin inhabits swampy plains and kaing grass patches, known as kwins, between paddy cultivation: in Upper Burma it is found in light scrub jungle, never in dense forest. The Thamin is gregarious, being found in herds of from 10 to 50, sometime more. In winter, the parties are smaller and consist almost entirely of does, the stags keeping to themselves singly. Bucks which have newly shed their horns also separate from the herds as they are annoyed by flies and by the does which lick the tender stump or pedicel. Stags begin to shed their horns in June in Manipur, September in Lower Burma, and June-July in Upper Burma. Horns are not shed annually, and Burmans say that the Thamin sheds its horns only once in three years. The rutting season lasts from May to July, and the young are born in November-January, the period of gestation being seven months; the young are generally born one at a birth, and are of a light fawn colour, spotted white. The males begin to acquire horns in the second or third year and are in their prime when six or seven years old. The female has a short barking grunt, the call of the male is lower and more prolonged. Their call is however very seldom heard.

Stalking Thamin affords very fine sport when they are to be found in scrub jungle. When disturbed, however, this deer at once makes for the open, a grassy plain or paddy field, where it cannot be approached. In Lower Burma where they inhabit kwins, the only way to get them is from an elephant as the kaing grass is very thick and difficult for beaters to work their way through. By far the easiest way to shoot this deer is to go after them in a country cart, when they will allow you to approach them up to 40 or 50 yards in the open, being almost as curious and confiding as a doe Cheetal. This method is generally adopted by the *sporting* Burman Myook, who goes out armed with a smooth bore charged with slugs and does not discriminate between a doe and a stag.

TAW-SEIK.

VI.—EXTRACTS, NOTES AND QUERIES.

Wood-gas for Lighting Towns.

The town of Deseronto (Canada) is lighted with wood-gas, says the *Moniteur Industriel*.

This gas is made in tanks full of sawdust, heated by a wood-fire. From the tanks extend a series of worms to distil the gaseous products.

On leaving the purifying apparatus, the gas has a less disagreeable smell than ordinary coal gas, something resembling that of the smoke of a grass fire. Two tons of sawdust produce 548 cubic metres of gas. The light is from 18 to 12 candle-power. Resinous woods are best. Finally the manufacture is less expensive than in the case of coal. We have here perhaps a better means of utilising sawdust, even than by making it into charcoal (*Révue des Eaux et Forêts*, December 1895).

Iron-bark in New South Wales.

For some time past the New South Wales Forestry Department has been making inquiries about the available supply of ironbark timber on Crown and Rreserved lands in New South Wales available for railway sleepers. Estimates have been obtained from the forest rangers in various districts; but although in some cases the returns forwarded have been very complete, in other cases the information obtained has been meagre. The statistics compiled from the returns show that there is an area of 6,196,000 acres of ironbark lands belonging to the Crown or in reserves in the colony. The estimated number of matured ironbark trees on this area is 16,870,000, which are calculated to contain 167,500,000 railway sleepers. These figures do not, of course, apply in any way to alienated lands. For instance, the 400,000 sleepers required for the Narrabri and Moree line were nearly all obtained from private lands. Taking into consideration the fact that the bulk of the ironbark lands of the colony is now in private hands, it is believed that the total available supply of ironbark in New South Wales might be roughly estimated at about 500,000,000 sleepers. This would be enough, not counting renewals, for somewhere about 250,000 miles of railway.—(*Engineering*).

Knots in Timber.

Timber without knots is almost as rare as fish without bones, and yet, for many purposes, knots must be considered as defects which depreciate the value of wood to a greater or less extent. Where wood is exposed to friction, as in flooring, or to strains which try its transverse strength, as in rafters, laths, joists, &c., knots are highly detrimental to the utility and efficiency of the goods made from it, and an endeavour is always made to cut such from the lower part of the stem in which the knots are small and extend but a short distance from the centre. The most objectionable form which knots assume is when they consist of plugs of dead wood embedded in the green or fresh timber, having no greater connection with the latter than a nail or staple driven into the wood. Thin boarding or laths containing these dead knots are

of low value, as the knots are apt to drop out when the surrounding wood begins to shrink, leaving cavities and weak places in the wood. Green knots also weaken the transverse strength of wood by interrupting the fibres and weakening the elasticity of the wood, but as they are nearly of the same hardness and texture as the surrounding tissues, and do not interfere with the cohesive strength, they are more readily tolerated than many other defects commonly found in timber.

It is probably the seller rather than the user of timber who loses most through the presence of knots, however. Sometimes, it is true, a timber merchant may purchase what is apparently a fine, sound stick, but which turns out partially useless owing to the presence of dead knots or defects caused by early injuries to the stem. But such instances are rare compared to those in which the purchaser declines to give account of their rough and knotty character. Those who have the slightest acquaintance with the buying and selling of timber know how unsatisfactory to both parties is a transaction over a lot of small, short-boled and heavily branched trees, and in many cases the price obtainable scarcely covers the cost of felling and making good the damages caused by its removal. It must also be borne in mind that the cost of felling timber is inversely proportional to the cubic contents of the trees. It costs no more, and in most cases less, to throw and trim a tall tree with a clean bole of forty or fifty feet and comparatively small crown, than it does to treat a low, wide-crowned tree in the same way, while the cost per cubic foot in the latter may be five or six times as great as that in the former, and the same applies to the subsequent handing of the log. These points are really at the bottom of the low prices which British-grown timber fetches in the market. The top prices given at timber sales for exceptionally fine trees are usually the double, and sometimes the treble of the average, and the keen competition for really good timber proves how ready timber buyers are to appreciate high quality. The prevalent custom in this country of thinning young woods too freely before the stem cleaning process is thoroughly completed produces trees with short stems and deep, wide crowns, owing to the unrestricted development of the latter never being checked by crowding. Imported timber, on the other hand, is usually selected from trees which have been drawn up in competition with their neighbours, and have early lost the side branches of the lower part of the stem. For English grown timber to successfully compete with foreign, they most be grown under the same conditions as the latter, and also be subjected to the same careful sampling and treatment after felling. Knots and lack of proper seasoning are the two great faults of our native timber, and until these faults are remedied, we cannot look for much improvement in the price. (A. C. FORBES, in the *Timber Trades Journal*).

Prize-day at the Imperial Forest School, Dehra Dun.

The sixth annual distribution of certificates and prizes was held on the 1st April in a spacious lecture tent, in the grounds of the School itself. The sides of the tent were hung with specimens of the maps and plans drawn by the students during their course of instruction at the School, while the best collections of plants made by the students were on view on the library table.

The proceedings commenced at 4-30 P.M., when Mr. Hill, the Officiating Inspector-General of Forests, accompanied by Mr. Gamble, Conservator of Forests, School Circle, and Director of the Institution, took his seat on the daïs. These officers were supported by Mr. Ribbentrop, C. I. E., Inspector-General of Forests, who has just returned to India from furlough ; Mr. Home, Conservator of Forests, Assam ; Mr. Popert, Conservator of Forests, Madras Presidency, Central Circle ; Mr. Oliver, Conservator of Forests, Upper Burma ; Mr. Smythies, Deputy Director of the School ; Mr. Pigot, Assistant Inspector-General of Forests ; Mr. Moir, Deputy Conservator of Forests, Jaunsar Division ; Messrs. Rogers and Osmaston, Instructors at the School ; Mr. Grenfell, Assistant Conservator of Forests, Dehra Dun Division ; Babu U. N. Kanjilal, Vernacular Instructor ; and Pandits Sada Nand and Keshavanand, Extra Assistant Conservators of Forests.

Invitations had been sent out to the whole station, and, in spite of the early hour fixed for the distribution of prizes and the unusual heat, nearly the whole station responded to the invitation and were present at the ceremony. Mr. Hill, after thanking the ladies and gentlemen present for their kind attendance and the evidence of their sympathy with the Institution which had now become so firmly established in their midst, called upon the Director to read his Report upon the year's work. Mr. Gamble then addressed the students and the assembled guests as follows :—

"We are come together to-day in order to witness the sixth of the annual gatherings for the distribution of certificates and prizes to the successful students of the year, and it becomes my duty to give you some brief account of the year's work and of the result of the recent examinations which have been held under the superintendence of the Inspector-General of Forests and the Board of Control of the year.

"At one time it had been hoped that the Lieutanant-Governor of the N.-W. P., Sir A. MacDonnell, would have been able to come and preside at our annual ceremony ; but the necessities of his tours prevented his coming to Dehra. Naturally there is some regret that he could not be present, for the support and sympathy of the ruler of the great province in which the School is situated could not but be of the greatest value to the Institution ; but we are fortunate in having as our President the Officiating Inspector-General of Forests, Mr. Hill, whose interest in the School is second to that of no one ; and in welcoming back to India, we may hope

in the best of health and spirits the head of the Indian Forest Department, Mr. Ribbentrop, who, although he has not yet re-assumed charge of his office, is kind enough to be present to-day to encourage us. In welcoming him back to India, I am sure you will all join, and I am equally sure that you will join with me in wishing Mr. Hill, who is about to leave India on a long holiday, a pleasant and prosperous journey and the best of time in the old country.

"We may now turn to the work of the year. The completeness of nearly all the supplementary buildings and the removal of unsightly old ones will enable us to still further improve our School grounds. The School may now be said to be completely fitted with its necessary buildings and grounds, and we may thank the Government of India for the interest which its completeness evidences, and we may boast that the Forest School and its buildings and gardens are a credit to Dehra Dún.

"In the staff there has been no important change. As regards minor changes, I myself have been away for some time, and I have every reason to thank my friend, Mr. Smythies, for the excellent arrangements made by him as Acting Director during my absence. Mr. Smythies has also taken short leave during the year, and the post of Deputy Director has been filled by Mr. A. F. Gradon, who himself has just left on a well-earned holiday. Mr. B. B. Osmaston has acted for some six months as Instructor, and has again returned to the School in that capacity.

"The health of the School during the year has not been so good as usual. There have been several cases of typhoid fever and other illnesses, but considering the prevalance of sickness in the Dún this year in general, the School has come off well enough; and we have to acknowledge that we owe something to our hospital assistant, Babu Ganga Sahai, and to the care and attention given by the Civil Surgeon. We have this year lost the help of Dr. Ruttledge, who has retired from Indian service to the regret of his many Dehra friends, but we have in Dr. Emerson a most efficient successor, to whom our best thanks are due for his interest in the School.

"I now come to the results of the examination. Last year I explained in my Report how it is that an honour certificate is a difficult one to earn, and that in order to get one a student must get over 75 per cent. of the total marks in all subjects as well as half marks in each special subject. This is not easy, and it is not surprising that honours are not given every year. There are no honour men this year. Of 37 candidates in the upper class and 8 in the lower class, 29 upper and 5 lower-class students have been granted certificates. That there are so many failures this year is to be regretted, and I fear that to some extent it may be due to the fact that students do not always, at the beginning of their course, realise how searching a test the final examinations are and consequently fail to work as hard as they ought to.

"The Board of Control have been pleased to award the following medals :—

Sylviculture	... W. H. Graham, Rikheshur.
Forest Engineering	... G. Wrafter.
Botany	... W. J. Anthony.
Zoology	... W. J. Anthony.
Forest Law	... B. D'Sa.
Herbarium	... S. E. F. Jenkins.

General Proficiency, Lower Class, Sheo Prashad.

"No medals were awarded for surveying, or utilisation and working plans.

Mr. Smythies's prize for an essay "on the treatment which would be proposed for the Thano sâl forest in the Dún at the next rotation" was won by E. A. Rooke. The Campbell-Walker prize for the best Madras student falls to B. D'Sa. The prize given by Mr. Bagshawe, Conservator of Forests, Berar, for the best Engineering note-book goes to J. W. Modder; and that given by Mr. Gradon, for the best Sylviculture note-book, to C. Hammond. The prize for the best in practical forestry, presented by Mr. McArthur Moir, goes to W. H. Graham, and that for a student in the lower class, presented by the Director, to Sansar Singh.

"No entomological collections were sent in for competition this year, and I hope that this means that next year there will be many candidates, good collections, and a keen competition. One of the most important of the subjects of study for Forest Officers is that of the damage done to the forests by injurious insects and the measures which have to be taken to prevent or minimise their depredations. The subject is also an important one in developing the power of observation, without which no one can become an efficient Forest Officer. Besides the herbarium of S. E. F. Jenkins, which won the prize, those made by Hatim Tai, Woothayya, Surendranath Chatrerjee and Hammond were reported by Mr. Duthie, the examiner, to be worthy of honourable mention.

"It will not be out of place for, me to mention the existence of a fund in which all students of this Institution, past and present ought to take a great interest. I mean the 'Brandis Fund'—a fund from which prizes are granted each year to present and past Students who have contributed articles of interest to the *Indian Forester*. Last year no award was made, but this year I have been asked to announce here that awards have been made to M. Rama Rao, A. M. Sawyer, Mian Moti Singh, and M. Narayan Rao. I hope that among the students who leave this year there will be many future winners of the Brandis prizes.

"The School athletic sports were held on the 11th November, and the most successful students were Kashi Ram and Graham. In the Volunteer sports the students were not so successful as usual, but in the shooting competitions Kelly, who is Troop Sergeant-Major, won the cups presented by Colonel St. G. Gore

and Mr. Bagshawe for members of the forest troop, and also the cup presented by General Sir R. Hume and open to the whole Corps. Our best acknowledgments are due to Colonel Harington, Major Leslie Rogers, and the Officers of the D. D. M. R., not excepting the energetic Sergeant-Major J. Allen, for their interest in the forest troop and the School. It will be a matter of great regret if Major Leslie Rogers, as it is rumoured he may do, severs his connection with the corps he has commanded so long. My best thanks are also due to Colonel Begbie and Colonel Newall for their help in giving us the assistance of havildars to teach drill, which I hope has, if irksome, been, at any rate, of physical service to the native students.

"This year we have had the benefit of a visit not only from both the permanent and acting Inspectors-General of Forests, but from three Conservators, all from distant provinces, and to them all our best acknowledgments are due. We are also much obliged to Mr. Reynolds, the Superintendent of Forest Surveys; Mr. Duthie, the Director of Botany, Northern India; and Mr. Finn, the Deputy Superintendent of the Calcutta Museum, for their help in the examinations.

"And now, students of the classes of 1894-96, it only remains for me to wish you good-bye and every success in your future careers as Forest Officers. I hope you will not forget the School and its teaching, and that you will always remember that practical observation and practical energy are the best passports to success in the Department.

"To my colleagues on the School staff, Messrs. Smythies, Gradon, Rogers, Osmaston, Babu U. N Kanjilal and Babu Birbal, as well as to the officers of the School Circle, Messrs. Moir and Grenfell, Babu K. Mukerjee, and Kasheshwar Mukerjee, Pandit Sadanand, and Babu Gopal Singh, I am indebted for the same constant support and assistance that they have given me in previous years.

"To you all, ladies and gentlemen of Dehra Dún, I am much obliged for the interest you have shown in this Institution by being present to-day, in spite of the warmth of the weather and the rather early hour."

Mr. Hill then asked Mrs. Smythies to distribute the certificates and prizes, which she did, saying a few suitable words of congratulation to each student as he came up to receive his prize or certificate. After this part of the ceremony was over, Mr. Hill, Inspector-General of Forests, made a suitable reference to the 1st April, and expressed his conviction of the very great confidence his audience must have in Mr. Gamble to have come to-day in response to his invitation. You have heard, "he continued," Mr. Gamble's report and have seen that Mr Ribbentrop, our Inspector-General, occupies an unofficial seat, and refrains from addressing you to-day; you lose much by his not addressing you, but when I tell you that he has graciously abstained from deposing

me in the middle of the School examinations out of consideration for my being about to go on long leave, I hope you will bear with my remarks and be content to look forward to a speech from Mr. Ribbentrop next year.

"Mr. Gamble's report tells of a year in which the students passing out have failed to maintain the standard of previous years; not only have none passed with honours, but a somewhat exceptional percentage have failed entirely, and the average marks of those passed are lower than usual. Although this is the case, still certain individuals, who have taken up special subjects, have distinguished themselves, and the medallists are as numerous as they were last year; and are in no sense behind their predecessors in their special subjects, but while taking up these they have neglected others of no less importance, and thus failed to obtain good grand totals of marks. To those students who have passed, I would say that you have failed to learn more than a part of what the School can teach you, and that this is only a drop in the ocean of what you have yet to learn before you can prove yourselves to be a credit to the School, and worthy members of the Government Service. Strive, therefore to turn the knowledge you have acquired to good account, and by careful observation and appreciation of facts and phenomena that may come in your way, endeavour to make yourselves thoroughly efficient officers of the State and of the Forest Service. You may have discouragements and disappointments, but you may rest assured that if you know your business and work with energy and strict observance of those principles which we have tried to impress upon you at the School, you must succeed. I wish everyone of you a long and healthful career of prosperity. Students of the first year, you may take to heart the failures of the present year and let next year be a record in honours and a generally high standard. You may count on a Board of Examiners not more lenient than that of 1896; you will be passed on rules which lay down a hard and fast constant standard, and as you work and put forth your best abilities so will you pass or fail.

It is now more than five years since Mr. Gamble, our popular Director, took up his duties here at Dehra. In one capacity or another I have been closely associated with the School, having been on duty here on no less than four occasions during the last three years, and therefore may claim to speak with some authority. I think you will one and all feel with me that Mr. Gamble's departure on furlough within a few months, even though some promotions depend on it, will be a distinct loss to the School. His successor, whoever he may be, may keep up the standard of instruction, may maintain that good feeling that prevails among the School officers, may guard with care and cleanliness the well arranged museum and well ordered grounds and buildings, but this notwithstanding, Mr. Gamble will be missed in many ways,

and I am sure you will all be with me in wishing him an enjoyable holiday and a speedy return to the charge of an Institution which has flourished under his fostering care and sound management, in a manner reflecting the highest credit on him.

"In conclusion, Mr. Director and officers of the Forest School, I am desired by the Board of Control now assembled, to convey to you their best thanks for the hearty co-operation afforded to them in their not altogether enviable rôle as examiners and controllers of the School curriculum, and I would ask all present (save the students who have come for their prizes and certificates) to accept the Board's acknowledgment of your kindness in driving out on such a warm afternoon to assist at the distribution. We are unanimous in thanking Mr. Gamble for his clear and interesting Report, and with our thanks to the Director, I would join a word of welcome to Mr. Ribbentrop whose place I have filled in all senses, more or less inadequately, for a little more than a year. I may safely say that the Department and his old friends are equally glad to see him back in his usual robust health and good spirits."

The ceremony was brought to a conclusion by cheers for Mr. Hill, Mr. Gamble, the School staff, &c., and then an adjournment was made to inspect the well appointed museums and grounds of the School, which are a standing evidence of Mr. Gamble's influence and work at the School. The collection of minerals and stones has been re-arranged during the year by the Director, and the entomological collections have also been put in order by the same indefatigable hand, so that all the School collections are now systematically arranged for the use of students and will bear comparison—and that a favourable one—with many older Forest Schools on the Continent of Europe.—(*Pioneer, April 7th, 1896*).

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd March 1896.

EAST INDIA TEAK.—The delivery of 4,443 loads in the first two months of the year as compared with 1,177 loads in that period of 1895, of which 2,236 loads stand to the credit of February 1896, against 334 loads in February 1895, augurs well for the future. The arrivals, however, have been heavy, and the stock has accumulated. Prices are still bounding upwards, but the rapidity of the advance has a little outrun actual business, and the latest quotations are rather more nominal than was the case in January.

ROSEWOOD.—East India. The small stock is firmly held, but demand is rather quiet.

SATINWOOD.—There is very little stock, but it is rather dull for sale.

EBONY.—East India.—Small parcels of good logs would sell readily, as there is no stock in first hands.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£6	to	£10
Satinwood	„ sup. foot	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, March 1896.

Cardamoms	per lb.	1s. 8d.	to	2s. 3d.
Croton seed	per cwt	50s.		
Cutch	„	20s	to	32s.
Gum Arabic, Madras	„	25s.	to	35s.
Gum Kino	„	£25	to	£30.
India-rubber, Assam	per lb.	1s. 7d.	to	2s. 2d.
„ Burma	„	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay	per cwt.	7s. 6d.	to	7s. 9d.
„ Jubbulpore	„	6s. 3d.	to	7s.
„ Godavari	„	5s.	to	5s. 6d.
Nux Vomica, good	„	3s.	to	8s.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	„	£4	to	£4 10s.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	50s.	to	100s.
Tamarind	„	9s.	to	11s.

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, Bareilly, and Delhi, for the Month of February 1896.

Description.	Timber scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sâl 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sâl and Sain, &c., Kuries 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0	...	...	
{ Sain...	30 0 0	40 0 0	...	..	
Sal bed posts, 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	..	...	
Bamboos of 9′ to 10′ per 100 score ..	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sâl, 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sâl and Sain, &c., Kuries 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	40 0 0	{ 100 0 0 / 500 0 0	
BAREILLY.					
Sal 10′, Tors (Poles) ...	5 0 0	10 0 0	–	...	
Sal and Sain, &c., 12′ × 5″ × 4″ { Sal...	25 0 0	35 0 0	...	...	
{ Sain	40 0 0	{ 50 0 0 / 60 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	137 0 0	
DELHI.					
Sâl, 10′ Tors (Poles) ...	12 0 0	8 0 0	...	...	
Sâl and Sain, &c., Kuries, 12′ × 5″ × 4″ { Sal ...	60 0 0	50 0 0	...	...	
{ Sain...	30 0 0	25 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	9 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	100 0 0	50 0 0	

THE

INDIAN FORESTER.

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The Forests and Fauna of British Central Africa.

There is but little to interest the traveller in the way of scenery on the east coast of Africa, as viewed from the deck of a steamer proceeding from Aden to Natal. Low sandy hills sparsely covered with thorny scrub jungle fringe the beach, whilst interminable mangrove* swamps line the banks of the rivers, and extend over such portions of the shores as are swampy and inundated by the tides. Here and there, a solitary Baobab† may be seen towering over the rest of the bush, whilst small islands are passed covered entirely with Casuarina.‡

At the Chinde mouth of the Zambesi river is situated the small British concession obtained from the Portuguese Government and used as a bonded warehouse. Within the concession no one is allowed to reside except the British Consul, the local Manager of the African Lakes Company, and the Manager of Sharrer's Zambesi Traffic Company. The Post Office is situated in the Consulate.

The banks of the Chinde river itself, and of its various channels are densely covered with mangrove forests which extend about 15 miles up the river. Beyond this, and outside the belts of mangrove are enormous marshy plains, with a very few acacias scattered about at long intervals. These plains are covered with high grass and reeds, and are the resort of both red buck and waterbuck. In the river, and in its numerous channels, hippopotami are fairly numerous. They occasionally enter the sea and thus travel from the mouth of one river to that of another.

The Portuguese have established a settlement outside of and adjoining the British concession, where Portuguese law, such as it is, is administered. For grave offences the punishment is transportation to the Portuguese colonies on the west coast of Africa; for minor offences, a liberal allowance of "Chikotee" (raw hippo-hide whip) is given.

* Avicennia officinalis. † Adansonia digitata. ‡ Casuarina equisetifolia.

A Commandant is in charge of the settlement, and obtains a considerable revenue from Customs duties, and the sale of mangrove timber and firewood—the latter being extensively used for fuel on the river steamers. Of course the mangrove forests are not worked on any system whatever, but the fuel is cut by the Manganjas wherever most convenient, and transported in boats to the wooding stations, as they are locally called, which are situated every 15 or 20 miles along the river banks. Almost all the buildings in Chinde are constructed of mangrove and corrugated iron. The mangrove poles being beautifully straight, and the timber dense and sound, there is very little labour expended in the erection of a building.

Travelling up the river by steamer, the small and neat Portuguese station of Zompa is passed, and a few miles further up the Zambesi is entered some 22 miles from Chinde. The country here is uninteresting and flat, mostly flooded in the rains, and consisting of extensive grass plains fringed by a thin forest of acacias of various species.

As there is great danger in travelling at night, both from concealed snags, and vicious hippopotami, all river steamers are tied up to the banks at night, whilst the crew, mostly Manganjas and Chikandos, land and cook their food. At daybreak, the steamers proceed again on their voyage, and if all goes well, travel from 40 to 60 miles a day ; but everything depends on the force of the current, and the position of the shifting sand banks on which steamers often get stuck for several days.

The scenery is much the same till the Shupanga forest is reached, when low hills covered principally with acacia forest, and scattered palm trees* come into sight on the south bank of the river. This forest is a very extensive one, and meets the Gorangoza forest, from whence the traveller can get to the seaport of Beira.

Proceeding north, the steamer leaves the Zambezi river, and enters the Shirè which averages about 150 yards in width, though in many places it is very much less. This river teems with crocodiles, of which immense numbers may be seen floating in the water, or sunning themselves on the sandbanks. The spurwinged goose is fairly abundant and the Egyptian goose may occasionally be seen ; but ducks, during the season, are in thousands, and the varieties of other waterfowl innumerable. Hippopotami are somewhat rare, having been shot down and frightened away by the numerous shooters on board every steamer, who keep up a constant and daily fusillade, and fire at every living thing they see. The two gunboats stationed on the river have also much to do with the destruction and frightening away of the game, for the officers and men are constantly out shooting (having little else to do) and the latter even give their weapons to the natives, and send them out to destroy the game.

* Borassus flabelliformis.

Proceeding up the Shirè, the Morampala Mountain on the east bank gradually comes into view, and as the steamer goes close to and completely round its southern base, a very good view is obtained of the forests. These are entirely deciduous, and run up to about 3,000 ft. elevation, above which is grass, with patches of evergreen forest in the valleys, and on the crest of the mountain, on its southern side.

A Missionary settlement was established on the small plateau at the summit, and the Missionaries planted an orchard there but subsequently shifted their quarters and abandoned the settlement. A planter of the name of Simpson made a small coffee estate on Morampala, and established a store at the foot of the mountain near Inhasugwengwe, but the Portuguese, with their usual rapacity, found a pretext for confiscating his property and driving him away.

From Morampala, parallel ranges of hills run north and south on both sides of the river, the valley of the river being a great marsh, known as the Pinda marsh. The country is perfectly flat on both sides of the river to the foot of the hills, which in some places is about fifteen miles distant, in others only three or four.

About 20 miles north of the Pinda Marsh, British territory is entered. A sign-board on the south bank informs the traveller of this fact. A few miles further, and the next little station of Port Herald is reached. A perfectly straight road bordered with clumps of plantains, and handsome little trees of * "Pride of India" leads to the Assistant Collector's house, a brick and iron building with a broad verandah round it. Other roads laid off at right angles divide the settlement into convenient blocks, which are available for sale; but at present only two blocks seem to have been taken up and built upon. At the back of the settlement and to the north of it a dense evergreen wood is situated almost touching the station, and is a favourite haunt of both lions and panthers, which have proved exceedingly troublesome at times. It is unsafe to walk about the station at night on this account. In this wood are numerous lofty white stemmed *Sterculias*, in which Marabout storks build their clumsy nests. The Sausage tree † is also common, and remarkable for its extraordinary looking and enormous fruit. Scandent on the loftier trees, is the handsome Kombé ‡ creeper, with its large whitish lilac flowers and curious hornlike pods, from the seed of which is obtained the deadly poison with which the Manganja smear their barbed arrows. This poison will kill an animal of the size of an eland in nine hours.

This is the first evengreen wood to be seen on the banks of the Shirè. Such woods are by no means common, and are only to be found in damp situations on the banks of streams or watercourses at rare intervals. The real Manganja term for them is

* Melia Azedarach. † Kigelia pinnata. ‡ Strophanthus Kombé.

"Insétu" plural "Masétu." The principal trees to be found in them are Acacias, tamarinds, baobabs, Sterculias, Kigelias, and numerous leguminous trees. The undergrowth consists principally of a thorny scandent Cæsalpinia, and various undershrubs, all more or less thorny and impenetrable. The only means of getting about inside the "Masetus" is to follow the rhino pathways, or old elephant tracks; but even then the labour is very great. There is considerable danger as well, of stumbling on a rhino or a lion asleep; besides which these strongholds are the favourite resort of panthers, hyenas, wart-hogs and buffalo. The only other animals that inhabit them, are the harnessed antelope, the bush buck, and two species of small antelope no bigger than a hare; of course they are full of vermin, in the shape of cats, mungooses, snakes, &c.

After leaving Port Herald, Chiromo is reached—some 70 miles distant. There the traveller's baggage is overhauled, and Custom duties exacted from him, after which he is free to travel in any part of the Protectorate.

My first trip was to the Elephant Marsh which lies principally on the north bank of the Shirè, a few miles from Chiromo, and extends northwards for a long distance towards Katunga's village. The marsh consists of more or less flat land sloping gently from the village of Mota at the base of the Shirè Highlands to the river, and across the river southwards it trends upwards towards the Ku-Pande Hills. The whole of the marsh is intersected with shallow channels, from 10 to 20 ft. wide and 5 or 6 ft. deep, by which the flood waters drain off into the river in the dry weather; and has, interspersed over it, hollow depressions of an acre or two in extent, in which the river water is retained. The canals are bordered with spiny-leaved "Bango" reeds, which afford cover to both lions and buffalo, with which the marsh abounds. These covers are dangerous to approach too close. A considerable portion of the marsh on the southern side is covered with a dense growth of an annual, something like wormwood in appearance, but more succulent. During the summer floods this plant dies; but remains standing. There are many hundreds of acres covered with it and as it grows from 10 to 15 feet high, it affords sufficient cover to wounded buffalo, and it is very dangerous to enter it. It is a wonderful sight to see a large herd of buffalo a thousand strong crashing, in their headlong flight, through this dry brushwood. The noise is deafening; but you can run with ease in the rear of the herd, for they leave a track 200 yards wide, and beaten perfectly flat.

Where the water has stood for any length of time, the liquid mud left by it is quickly covered by an aquatic species of *Ipomœa*, with a pretty pink flower. This is the favourite food of both buffalo and waterbuck.

Near the hills, the marsh is covered with beautiful short grass of fine quality, clumps of the *Hyphæne* palm, and scattered dwarf trees of Acacia, with a few patches of a coarse rank grass that grows in tussocks—a favourite cover for lions. This grass grows from 10 to 12 ft. high in places. The whole country is one mass of white-ant hills. These are all single cones from 10 to 13 feet high, and are almost invariably bent over at the tips towards the north-west. It is difficult to account for this, unless it has something to do with the prevailing direction of the wind and monsoons.

On almost every ant-heap a vulture may be seen sitting at day break, waiting patiently for the white butcher to come and provide it with a meal, for the black man when he shoots a buffalo leaves very little for the vulture or anything else to eat. Climbing an ant-heap, and sitting on the top of it a wonderful sight meets the eye. Far to the left, a black line more than a mile in length, with a dense white cloud of egrets hovering in the air over it, proclaims a herd of buffalo. Another herd, a mile to the right, is lying down, covering an acre of ground with what appears to be heaps of jet black rocks; but here again the snowy white egrets, perched on the black bodies, betray their friends. Galloping about in squadrons, or peacefully grazing, are herds of zebra, whilst other herds of waterbuck are either feeding mixed up with the zebra, or walking in long lines over the bright green meadows. Long V-shaped flights of geese, flamingoes and pelicans fly from pool to pool. Not a sound disturbs this great plain, except the distant grunts and lowing of the buffalo, the snort of a waterbuck that has suddenly descried your native gun-bearer perched ape-like on an ant heap, or the far off moaning of a hungry lion disappointed of his prey.

Suddenly a puff of white smoke rises in the air, and the distant boom of a heavy gun rumbles over the marsh, followed by the sharp reports of Lee-Metford rifles—the great herds of buffalo are in instant commotion, and the firing becomes rapid and continuous. Clouds of dust arise as the buffalo gallop over the plain, followed by sundry small specks—nearer and nearer comes the great herd at a slow lumbering gallop, till they thunder past, but the shooters are busy now killing the wounded and cripples Vultures and Marabout cranes are now descending in thousands to devour the slain, whilst a dozen Manganja "boys" are cutting up a buffalo. The noble sportsmen (!) have butchered over twenty buffalo and wounded another score and are seated in the shade of yonder palm-tree discussing whiskies and sodas, and their morning's exploits. A dozen motherless calves are wandering in the plain lowing for their lost parents—and will fall a prey to the first hyenas that see them, or die of starvation.

Walking back to camp, the bleaching skulls of buffalo and waterbuck are everywhere to be seen, attesting forcibly the

useless slaughter of the past. In Chiromo itself, piles of buffalo heads may be seen in every compound, either on the tops of ant-heaps, or wedged in the branches of trees, where the horns are speedily destroyed by borers. The slaughter of the buffalo is even worse when some globe-trotters appear on the scene, for they camp in the marsh for a fortnight at a time, and too cowardly to approach the buffalo close, fire at them from two or three hundred yards' distance with Lee-Metford rifles, wounding fifty times as many as they kill. I have heard over 150 shots fired of a morning in the marsh at buffalo and waterbuck before 10 a. m. Gunmakers now-a-days seem to cater for cowardly and lazy shooters, and it is impossible to take up the 'Field' without finding advertisements from half a dozen gunmakers who vie with one another in guaranteeing rifles for African sport to shoot from 400 to 1,500 yards with extreme accuracy. These gunmakers are the men who by supplying these long-range game rifles to all sorts of incompetent butchers, enable them to wound and destroy animals at half a mile distance, not one-tenth of which are ever brought to bag. Thus: two colonials from Natal were firing *every day* at buffalo in the Elephant marsh with Lee-Metford rifles for a fortnight, and the total number bagged by them was five! I was myself so disgusted with the tameness of the African buffalo in the Elephant marsh that after singling out and shooting four of the best bulls I could find—only one each day—I left the marsh and never returned to it, though it was only three miles from my head-quarters. I caught a splendid bull calf which I tried to rear with tinned milk unsuccessfully, but a *post mortem* revealed the fact that my rascally boys had so seriously injured it internally that it could not have lived. We were more successful with a cow calf which lived for some months. My intention was to have brought a pair of calves to India.

My next trip was to the tract of country south-east of the Shirè, and between that river and the Zambezi, but this I will reserve for the present. R. M.

(*To be continued.*)

Too much Fire-protection in Burma.

At the present time there is a very marked tendency to advocate the enlargement of the fire-protected areas in Burma, and the idea is spreading that the fire-protection of all teak forests is a *sine quâ non* of successful management. Our department has fought the battle of protection and the money spent on this work has been well invested, for hitherto protection has generally followed plantation work, with this no Forest Officer could disagree But we are growing more ambitious and now aspire to attempting sooner or later, the protection of all teak-bearing forests; there

is even now a scheme on foot to protect the whole block of the Pegu Yomahs which may be said to contain the greater part of the teak forests of Lower Burma. The Government of India's Resolution on the Annual Report for 1894-95 is very strong on increased protection.

There is no doubt of the great benefit derived from the protection of our plantations in their early years; we can prove it in many ways, but in what way can we prove that fire-protection extended to our ordinary teak forests is a benefit and not a curse? It is the province of a Forest Officer to test new theories on experimental areas and to apply those which seem to stand the tests to larger areas. The system of protecting teak plantations has been tried, and the success gained warrants the protection of all such plantations *in their early years*, even at a cost greatly exceeding that of present operations.

The system has also been tested for ordinary teak forest—certain areas of forest lying between plantations and included in the same fire trace have been protected for years, but can any Forest Officer yet decide whether the protection has been beneficial or not? A mere expression of opinion is not sufficient in a question of this importance, the benefit derived should be proved by figures, by ascertained and verified statistics, and it would then be for Forest Officers generally to determine whether the results were worth the expenditure. Until this has been done, I think we should give a verdict of "not proven" and deprecate any great increase in expenditure on *general* fire-protection.

We may take it for granted that our teak forests, or the greater part of those from which the best teak is extracted, are burnt over every year. For the information of those who do not know Burma, it may be as well to state that this fire in no way resembles the huge forest fires of America; it is merely a ground fire slowly but surely advancing and consuming the dry leaves which cover the ground to a depth of a few inches or less. As a rule the flames are not more than a foot or so high and a pony will step over them; in places of course there are patches of dry grass and *debris* where fire is often very fierce, but these are quite exceptional. A fire once started may burn for weeks and travel from one end of Burma to the other.

It is argued that because these annual fires are unnatural and owe their origin to human carelessness, therefore, by protecting the forests from fire, we are counteracting the evil and restoring to the forest its former condition of existence. I venture to disagree with this theory *in toto*. The very first settlers in Burma must have employed fire to clear their village sites, and these fires would spread as they do now from one end of the land to the other; we may therefore presume that as long as man has inhabited the province, so long have the forests been annually burnt over; to find the time when they were not subjected to the

ordeal we must go back to remote ages, and we have no evidence that the teak (as we now know it) existed or could have existed under the circumstances at that period. I think we may take it for granted that these annual fires, though originally perhaps due to accident, are now so constant and regular as to have become natural to the teak, destructive or harmful possibly at first. Nature by this time must have stepped in to fortify the teak against deterioration and to provide it with means to flourish under its altered condition ; may not the thickened seed and the corky bark, both alike unaffected by the ordinary ground fire, have been gradually developed for this purpose ?

Let us for a moment consider the effect of the ordinary fire :—

(*a*) At the time of the annual fires *the teak seed* has already fallen : as the fire passes over it, it is charred and blackened on the outside, but thanks to its hard exterior, its vitality is in no way impaired.

(*b*) The *young teak seedling* suffers considerably : in its infancy it is burnt down to the ground year after year, but the root remains undamaged, and at the commencement of the following rains the seedling shoots up again with yearly increasing vigour, the outside bark becoming more and more corky. At last comes a year when, owing perhaps to the fire being less severe than usual or to some other cause, the seedling is able to resist the fire ; it is now established and has little to fear from the devouring element in the future. There is a general belief, however, that although the root may remain undamaged as regards its vitality, the actual wounds caused by the fire never really heal and are responsible for a great deal of the hollow timber we meet with in the forests.

(*c*) On *the teak tree* with its protecting outside layer of corky bark the fire has absolutely no effect.

(*d*) *All other vegetation* (with possibly one or two exceptions, though I can recall none) suffers very much more severely in its younger stages than the teak, and consequently the annual fire cannot be considered otherwise than as an agent favouring the growth of teak at the expense of all (or almost all) other species.

Though not yet conclusively proved, it is almost certain that the teak seed demands for its germination a good deal of light if not direct sun heat : by destroying leaves, low brushwood and seeds of vegetable species of more rapid germination than the teak seed, which would tend to shut out that light and heat, the fire doubtless assists the teak. To such an extent has the utility of fire in this way been recognised that many Forest Officers are of opinion that natural reproduction of teak over large areas, without the previous assistance of fire, is an impossiblity.

Let us now consider one of our teak plantations and the effect of fire-protection. Previous to putting out the seed, all the existing vegetation is felled and burned ; in the *taungyas* a

few tall trees are occasionally left, but all the low cover is most carefully destroyed ; the seed is then sown in rows. This is more or less copying Nature, the difference being that more cover is destroyed, thereby reducing future expenditure in clearing the teak saplings, and also that the seed is placed in the most advantageous position. By fire tracing the plantation we preserve the seedlings from being burnt back, and in this way we not only remove one fruitful source of unsound timber, but we also reduce by some years the time taken by a seedling to reach maturity (in some of our working plans the rotation is calculated on a basis of allowing ten years for a seedling to establish itself, *i.e.*, to attain that size when it is no longer liable to be burnt back). But having shut out the fire which we have shown to be a natural means of destroying the teak's vegetable enemies, we must either see those enemies (quick growing when protected) smother the teak, or we must take steps to free our young seedlings by hand ; this we have done, and large sums are annually spent on " weeding plantations."

We will suppose then that we have seen our plantation safely through its difficulties up to the age of immunity from ground fires ; the question now arises as to whether we are justified in still spending money on protecting it from these fires. If we henceforth allow our plantation to be burnt over annually, we of course save the cost of protection ; we also reduce the cost of subsequent "weedings" and this without any danger of causing direct damage to the saplings. But it may be argued that the fire acts detrimentally in an indirect way by destroying the *humus* and in baking up the soil. This I venture to assert is a purely theoretical damage. We are accustomed to see our oaks, our pines and our deodars all luxuriating in deep humus, and we jump to the conclusion that similar conditions should be provided for the teak, if we are to obtain the best results. Have we any evidence that our teak *wants* humus or even *likes* it ? I will go further and ask if this humus may not be even baneful. The same may be said about the baking up of the soil, we find the teak growing under certain conditions, we are convinced that it has so grown for ages, and yet we seek to change those conditions without any proof that we are not thereby actually damaging the object of our care.

These fires do destroy every year a certain amount of more or less valuable material in the shape of logs and dead trees but with care and supervision this is preventible ; on the other hand they do an immense amount of good by destroying decayed stumps and branches which in a fire-protected forest are sources of fungoid growth and the breeding grounds of so many insect pests.

In Burma where there may be only one underpaid Forest Guard to look after a hundred square miles of reserved

forest to say nothing of unreserved forest, it is hopeless to expect very much, but the practical application of the above would appear to lie, not in the general extension of fire-protection over hundreds of thousands of acres which cannot be watched in detail, but in the curtailment of existing fire lines so as to exclude the older plantations and in the protection of other small defined areas on which careful examination has revealed a fairly good stock of young seedlings. As the saplings on each area so protected reached the stage of immunity the protection would be stopped, and further areas operated on—the total area being limited by the number of seedlings and the amount of supervision available.

There is always a danger that remarks of this sort may be taken hold of by those who are not Forest Officers and strained to mean more than they were ever intended to convey. The abolition of fire-protection is not advocated, but its general extension to huge areas of forest irrespective of the state of the forest as regards natural regeneration is to be deprecated. I hold, until the contrary has been proved, that these annually recurring ground fires should be considered as the friends and not the natural enemies of the teak except during a certain period of its existence. Further, I hold that fire is one of the forest officer's most useful agents as long as it is his servant and not his master.

I am aware that these opinions are liable to be severely criticised, and I would ask those who do not agree with them to use the columns of the *Indian Forester* to ventilate their views on this important and interesting question.

LAKON; 21*st March* 1896. } H. S.

This article must be read as referring only to Burma, the remarks would not, we think, apply anywhere this side of the Bay. We hope some of our Burma readers will take up the gauntlet thrown down in the last para. and give their opinions, but we are bound to say that we disagree with our author in objecting to opinions, and requiring statistical proof. In Forestry, in our view, it is the mature opinion of experienced professional men that is more valuable than statistics.—HON. ED.

The Compounds of Nitrogen contained in Hoar-frost.

In their researches into the composition of the atmosphere, MM. Petermann and Graftiau have noted the considerable amount of compounds of nitrogen contained in hoar-frost, and have drawn attention to the part played by this meteorological phenomenon in the formation of the stock of nitrogenous matter in forests, as also to the purifying action of wooded areas on atmospheric air.

"The hoar-frost deposited on branches presents to the air, 'which bathes it on all sides in a constantly renewed stream, a 'large surface of absorption for the soluble matters which it con- 'tains; isolated trees, plantations, forests, form immense filters, 'which purify the air passing through their branches and take 'from it its nitrogenous compounds, and these latter are carried 'down to the soil, when a thaw sets in, to feed the vegetation and 'once more enter the cycle of life. When we see the trees bending 'under the weight of hoar-frost and the branches almost breaking 'under the accumulated weight, we can easily understand that 'hoar-frost is an appreciable factor in the stock of nitrogenous 'matter collected in forests."

The following are analyses of hoar-frost collected at Gembloux and given in the above-mentioned work :—

	Combined nitrogen per litre. Milligrammes.
Water from hoar-frost of the 1st March 1889 ...	5·86
" " " " 2nd Jan. 1890 ...	7·70
" " " " 31st Dec. " ...	9·00
" " " " " " ...	8·00
" " " " " "	7·02
	Mean 7·52

M. Graftiau made several experiments during the severe cold weather of last winter in order to discover the amount of hoar-frost that can attach itself to branches. Between nine and ten on the 7th February, with the thermometer at 168 C. below zero, the observer of the Agronomic Station of Gembloux collected hoar-frost on different species of shrubs growing in the park of the Agricultural Institute and obtained the following figures :—

	Weight of hoar-frost.	Weight of the branch.	Approximate surface of the branch.
Cornus sanguinea ...	2·0 grams.	2·0 grams.	30 Sq. centimetres.
Populus alba ...	2·8 "	3·6 "	30 " "
Ribes saxatile ...	5·5 "	52· "	100 " "
Salix alba ...	34·1 "	15·0 "	203 " "
Salix vitellina ...	39·3 "	32·1 "	270 " "

Mr. Graftiau also weighed the hoar-frost of a complete shrub (*Betula rotundifolia*). The cube of the surface bounded by the extremities of the branches being about 1·5 cubic metres the weight amounted to 1·755 kilogrammes and the hoar-frost contained per litre :—

	Milligrammes.
Ammonia	4·0
Nitric acid and nitrous acid	1·2
Combined nitrogen ...	5·2

"The hoar-frost of the 7th February was not very abundant," says M. Graftiau, "and yet its weight exceeded one kilogramme 'per cubic metre of the space occupied by the branches. The 'branches in a high forest cover, at a low estimate, 100,000 'cubic metres to the hectare (2½ acres) and can retain 100,000 'kilogrammes of hoar-frost, which represents a supply of ½ kilo-'gramme of combined nitrogen, when we adopt as a basis for 'calculation the very slight amount of hoar-frost collected during 'the severe cold of the 7th February. Taking the mean figure of '7·5 milligrammes, this will come to 800 grammes."

"Hoar-frost is sometimes extraordinarily plentiful. It can 'on such occasions break by its weight branches of 10 centimetres in 'diameter. The amount of nitrogen that it then gives up to the soil 'on which it falls becomes considerable.

"If we add to that the nitrogen of rain, dew and fog, we can 'easily see how it is that, without any artificial supply of nitrogen 'and without considering the gain that may come from the presence 'of species that can fix nitrogen, forest vegetation can always find 'its nitrogenous food, and can see how wooded countries obtain 'this element from the detritus that falls in the forest."

As MM. Petermann and Graftiau say, the remarkable thickness of hoar-frost is one of the most interesting points in the complicated mechanism of the circulation and distribution of nitrogen throughout the world.

(*Révue des Eaux et Forêts*, from the *Journal d'Agriculture pratique*).

Torrent Barriers in Switzerland.

The *Révue des Eaux et Forêts* for March 10th quotes an article from a Swiss Forest periodical describing the successful, cheap, easy and ingenious method employed to prevent the ravining of the sides of Mount Pilatus, near Lucerne. Four different systems are used according to the depth and nature of the ravines to be negotiated. First, for small ravines, at most 1½ metres in breadth, they put a single line of piles across the bed and tie them together with wattling (*clayonnages*). The piles form a curve, the lowest part being in the centre and standing half a metre above ground level. Taller piles are carried away, it is found. These structures are placed at distances varying according to the slope and the quantity of water to be dealt with. To start with, the lines of piles are fixed at considerable distances apart, and gradually intermediate lines are introduced. The piles require an occasional touch with the mallet, and it may even happen that a second line, just below, has to be introduced.

The second system is used for rather deep ravines of some two or three metres and consists in laying fascines in the direction of the stream, in rows of which each lies back somewhat from the

one immediately below, thus forming a slight slope downwards. The small ends of the fascines are uppermost. A row (or more) of piles, of which the heads form a curve across the ravine, the width being the lowest part of the curve, is driven laterally through the heap of fascines, and the whole is strengthened with cross poles, or staves fixed in between the heads of the piles. This obstruction must not be over 1·20 metres high, and if it is nearly this height, cross poles run into the side banks are required. In a very little time, gravel and mud become deposited and the obstruction is rendered perfectly strong.

The third system deals with very deep ravines down which much water may flow. The piles are driven into the bed, both across it and also longitudinally to some extent, being spaced at less than a metre apart, but it is not necessary to be too particular in spacing the piles, only they must rise to equal height above the stream bed, some three or four feet. Between the piles are put down branches, roots, stones and fascines in and out without order leaving the heads of the piles standing up some 20 or 30 centimetres and in a very little while the interstices become naturally filled up with mud and gravel.

The fourth system is more ambitious though still very simple. It deals with real torrent beds and consists of two lines of piles across the river bed, the upper standing and at most one metre above the soil, and the lower being driven right home. Between the lines a large number more are driven, but in such a way as to preserve an even face when the work is finished. Stones are forced in firmly between the piles right up to their heads. If suitable stones are not to be had, the piles are put closer, and may even be woven about with wattling before such stones as are to be had are put in. These systems of torrent obstruction are very cheap and require very little up-keep, and they are enormously strong.

It is perhaps not in many places in India that the forester is likely to be called on to negotiate torrents, but such a demand is by no means an improbability, especially when we consider the shaly nature of a great part of the Himalaya. The monsoon would tax one's best powers in this direction, we think.

Counting Yas in Burma.

The counting should be done in December after the rains, when sickly plants have had a chance of dying out, if they are going to. It is best to work with about five coolies, *i.e.*, a party of six, including self and the forester or guard. This number is easiest to manage, but, of course, there is nothing against using even 20 if you have the men well in hand. On no account have the man who planted the yas as a counter, for if you did, should he get on a bad line, and the bad lines are known to him, he would be likely to say that less were dead and more alive than is really the case

On arrival at the ya, the first thing to do, is to get each man supplied with a stock of sticks or what not, for marking each plant down as he arrives at it. In the Prome Division a very good marker is used, one too that is well adapted for use by a Burman. It is called a "gayo" and is made as follows, a piece of bamboo is taken 9 to 12 inches long, about 1 inch wide and $\frac{3}{8}$ inch thick, this is then first of all marked with a dah with parallel horizontal lines on the outside in multiples of 10, 20 being the common number. The piece of bamboo is then split up nearly to the end into narrow strips 10 to 15 in number (as in ii) each man takes five or six of these. It is customary for the planter of the ya to have these made ready for the counting party.

A day or two before commencing to count, the rows should be cleared for at least one foot on either side of the row. This is of great importance. *1stly.* As it gives the young seedling an impetus and more growth is put on. *2ndly.* It makes the counting ten times easier. All is now ready for the actual task of counting. The coolies are placed along one edge of the ya in order, each coolie taking one line down which he proceeds, as he comes to each plant he gives the strand of the gayo on the right a bend, if a blank or dead plant is found, he gives a bend on the extreme left strand. On arrival at the end of the line, the officer keeping the list takes down the results, beginning at number one, then two, and so on. He should particularly notice the total number in each line and the proportion of live to dead plants, and should there be any great difference in the lines, he himself should recount the line which differs. The end man on the inside ought at once to put a piece of twig or branch at the end of the line counted by him; so that in case of any confusion the last line counted is at once known, and it is easy to commence another series of lines without any chance of recounting, and thus getting a line in twice or of on the other hand missing out a line. The officer in charge should pay especial attention to this. Having finished one series of lines, the party proceeds back again in the opposite direction and counts another set of lines and so on until the ya is finished.

The form of 'gayo' above mentioned is very suitable, as for each complete strand the counter knows he has, say, 10 or 20 plants marked, and thus instead of having to count each bend, he has only to count the number of strands and multiply, the odd ones on the incomplete strand being added. When counting in the Zamayi (Pegu Division) in 1890, I found that the Karens used long "lines" (thin split strips of bamboo) sometimes 6 feet long. No divisions were made, and each bend had to be counted. This was a long and tedious work and errors were very liable to creep in.

The ya planter knows how many "panets" or sticks he put down when the ya was pegged out previous to planting, so that it is as well always to add up your list *in situ* and compare the total number dead and alive with the number of sticks which

the planter says he has put down. Should you find any startling difference, the ya ought to be recounted: by a startling difference, I mean an error of more than 5 per cent. in a compact ya or 10 per cent. in a straggling ya, or more plants than were said to be planted.

A deficiency is easily accounted for, as the outside plants often do not grow or again those in wet hollows.

An excess would at once lead you to suppose that the coolies had been favouring the planter and adding on, but with efficient supervision as you take the numbers down at the end of each line, such a contingency should never occur.

When checking, countings made by a ranger, it is sufficient to recount about 10 per cent. but these should be fairly scattered; and never take nice easy ones near a bungalow, as such are likely to be done well as the ranger expects them to be recounted.

You will never get the number exactly the same, but there should not be an error of more than 4 per cent. and the proportion of dead to alive should be just the same if counted soon after, but if counted some time after, and the weather has been dry, an error of about 8 per cent. may be allowed.

When checking the Divisional Officer should note whether the yas have been cut in places where teak and cutch are plentiful, if he finds such to be the case, he should reprimand or fine the guard and should not grant permission to the cutter to cut again.

If there are teak or cutch killed, they should be noted, so that it may be seen whether the guard has reported the fact.

All unreserved trees must be thoroughly killed, and if they are not, the ya cutter should be made to kill them before he is paid, and a small fine inflicted It should also be noticed whether trees and bamboos cut are cut near the ground, and whether they are sending out stool shoots, if the latter, all should be cut before payment; if the former, a small fine inflicted, and a warning given to the planter that if trees are not cut close to the ground he will not have a license given to him another year.

If the lines have not been opened out properly and all bamboos near the edge cut, payment should be deferred until this is done.

At the time of counting, the compartment number should always be noted and the position of the ya marked on the map. The distance between the rows and the plants should also be checked.

F. J. BRANTHWAITE.

II.—CORRESPONDENCE.

Flowering of Strobolanthes in Jaunsar.

A species of Strobilanthes (*S. Wallichii*) which is common in the oak and fir forests in Jaunsar flowered and died in 1882. The same event occurred in 1894, and last year we noticed the old dead stems, but we could not find any seedlings. This year, however, small seedlings about two inches high are visible in great numbers. There is no mistaking them as they exhibit the characteristic breaking off of the herbaceous portion at a node. The term therefore of this plant is apparently 12 years, and this coincides exactly with information supplied by the Jaunsaris. It is when this plant has flowered gregariously that there is a chance for oak and fir seedlings to make a start and send their roots into the soil, at other times occupied by the dense matted root-system of the *Strobilanthes*.

A. S.

We may add to the above note, that some few years ago, the whole of the *Strobilanthes* in part of an oak forest near Deoban was pulled up by the roots and thrown away, and in this area, as might be expected, and so far as we can tell from a fairly close scrutiny, there are no new seedlings at all. It may be worth knowing that gregarious *Strobilanthes* can be successfully and permanently got rid of in this way.

HON. ED.

Flowering of Strobilanthes in Bombay.

SIR,

The *Strobilanthes callosus* has seeded all along the western ghauts of this district. The last seeding appears to have been in 1886-87, but I have no absolute proof of this. I remember it seeded in Khandesh on the Satpuras in 1888-89.

R. S. FAGAN.

Mr. Ribbentrop's letter on the Forests of Victoria.

SIR,

On reading my November *Forester*, I could not help smiling and remarking that "*this man has been there before*," meaning before he went to Australia, only he did not like to say so. Oh, why have we not some Australian Inspector-General to visit this country and write Mr. Ribbentrop's letter, almost word for word, to the Governments of India, Bombay, Madras, &c. He would have to omit the reference to individually interested parties, but for the rest, the cap fits excellently well. Even the main conclusions may be adopted *mutatis mutandis*.

(*a*) The forest law might be applied with considerable advantage if that were the serious intention of the Government.

(*b*) The area of inalienable State Forest has not been increased as it needs increasing.

(*c*) No doubt additions have been made to the *grazing and fodder reserves* (by the transfer of whole talukas from Reserved Forests, though they continue to be *recorded* as the latter) thus proving the inadequacy of such permanent conservancy as is permitted.

(*d*) The *protection of the forests against fire* has never been even attempted outside of the Forest Department itself, and abuses in the treatment of forests are still rampant.

(*e*) The *income* from the hitherto workable forests is ridiculously out of proportion to the money spent on protection, maintenance and improvements.

The next paragraph of *reasons* is equally pertinent, disregard of the public weal in favour of political influence, absence of adequate defenders, &c., &c., but why continue? They that run may read.

VELLEDA.

Fungus on Prickly Pear.

SIR,

I have for some time past noticed an orange-coloured disc-shaped fungus attack the prickly pear, and such parts of the plant as are attacked by it are eventually partially or entirely killed out by it.

I have sent you specimens of the different stages of the decomposition which results from the attack, for your examination.

The parts when affected generally assume a light yellowish hue and then dry up and wither.

If you find my notes to correspond with the specimens which I have sent you, please kindly publish them for general information for your readers of the *Indian Forester*, many of whom probably may have something to say on the matter.

S. C. MOSS.

We have examined the specimens sent. The patches are round, bossed in the middle, and look rather more like the work of an insect than of a fungus.—HON. ED.

Identification of Kashmir Minor Products.

SIR,

On page 109 of the *Forester* for March, you mention some of the minor produce sold in the Kashmir forests, the names of which have puzzled you, as well they might, some being Kashmiri, others Persian. I will therefore identify them for you. "Barg Tuz" is the birch bark, extensively used for roofing and other purposes; "Kahzaban" should, strictly speaking, be "Gaozaban"

(cow's tongue) from the resemblance, it is the leaf of *Onosma bracteatum* (Watt. Ec. Prod., page 486) ; "Guchhian" are Morells (*Morchella esculenta*) the name should probably be "Kanagach" or "Kanguchi", these are largely collected in April in Kashmir, and strung on a thread to dry in the sun, they find their way to the bazars in the plains in large quantities, they make excellent "toasts" and are a nice adjunct to meat stews ; "bekh roil" I have not yet identified, it is a root ; "Ashkar" is pearl ash, in Kashmir they extract it in a primitive and dangerous way, for the forest at any rate, the simple plan is to find a huge dead *Abies Webbiana*, make a heap of dry branches round the base and set fire to it, they then go home and return in a week or so, by which time the tree is reduced to ashes, from which the "ashkar" is obtained. It can be imagined that such a dangerous process could not be allowed to continue, and was stopped ; in consequence many petitions have been sent to the Darbar, Resident, &c., and great pressure has been brought to allow it to continue, but the Forest Department stands firm and says the people must find some other means of making it in the future. "Buzgala" is the common or garden sheep on which a grazing tax is levied. "Parshaushan" is really "Parsiansh", "an" being plural, it is the "*Adiantum venustum*," its uses are very fully given in "Economic Products."

J. C. McD.

Climber Cutting.

SIR,

Hitherto prescriptions relating to the cutting of climbers have been simply to the effect that such and such compartments were to be cut over in such and such a year. Surely, however, this is too sweeping, for it cannot be denied that the cutting of climbers is very often inadvisable and more. The *Millettia* is a most useful agent in invading grass areas and paving the way for the introduction of better species by eliminating the grass, and both *Millettia* and *Bauhinia Vahlii* (especially this latter) are highly beneficial in protecting very steep banks.

It is, however, not an easy matter to teach your ordinary Range Officer when a climber is useful and when not, and it therefore becomes necessary to issue some kind of hard and fast rule for them to work upon. The order I have issued in my Division is as given below, but I would feel obliged if anyone could suggest a better one.

"No climbers to be cut on very steep banks. No climbers 'to be cut in other places save when they are either actually on 'a tree or within 10ft. of one, and this does not apply to very 'inferior species."

I have in my mind's eye a beautiful area of high, close, sâl poles, with an undergrowth composed in great part of Millettia, which was merely shading the soil and in no way injuring the trees. The only thing is, how long can we leave these climbers alone, before they become noxious? My rule to cut any climber within 10ft. of a tree was intended to bridge over the time till the next climber-cutting came round. The great want in my Division is to cover over the soil with anything as quickly as may be. The extreme value of cover is constantly forgotten, and the late discoveries about Symbiosis only shew still more how important it is, for without cover the soil will dry up and the mycelia with it. Further, the soil will be less rich, and the mycelia less abundant.

'Q.'

III.—OFFICIAL PAPERS & INTELLIGENCE.

The Indian Forest Department and Coopers Hill.

The Inspector-General of Forests writes to us "With reference 'to an article in the *Indian Forester* for December 1895, I am direct-'ed to forward the enclosed communication from the Secretary of 'State for insertion in the *Indian Forester*."

We are very glad to print the correspondence sent us, and feel sure that it will be of great interest to our readers. Our own comments have already appeared at page 140 of our April number, and we have, in that number, explained that the orders of the Secretary of State of 1893 have never been inserted in the "Civil Service Regulations," so that we could not be expected to know of them. We certainly did not know of them, and we suspect that even in the Public Works Department they are not very generally known.

We have read Sir A. Godley's last paragraph with much satisfaction, and hope they will solve the question satisfactorily for us.

INDIA OFFICE;
LONDON, *5th March* 1896.

REVENUE No. 28.

TO HIS EXCELLENCY THE RIGHT HONOURABLE THE GOVERNOR-GENERAL OF INDIA IN COUNCIL.

Forest Service; Regulations for Examination of Candidates.

MY LORD,

I forward for your Excellency's information, copy of a letter from General Sir A. Taylor, and of the reply I have caused to be sent to him regarding the meaning and the accuracy of paragraph 17 of the Regulations for the Examination of Candidates for the Indian Forest Department.

I have the honour to be,
MY LORD,
Your Lordship's most obedient humble Servant,
(Sd.) GEORGE HAMILTON.

ENCLOSURES.

No. 1.

COOPERS HILL;
ENGLEFIELD GREEN, SURREY,
29th January 1896.

MY DEAR BERNARD,

Coopers Hill is being held to blame in connection with the idea that prevails, more or less, that the equality between Forest Officers and Officers of the Department of Public Works in the matter of pension, which in paragraph 17 of the Forest Prospectus is said to obtain, does not, as a matter of fact, exist.

I would urge that if there is the very faintest shadow of a doubt in regard to the "equality," it is altogether desirable that the statement in the Forest Prospectus should be omitted in future and cancelled in all copies that may be issued until a reprint occurs.

I send herewith a copy of the *Indian Forester* of December 1895, and would ask you to look at page 452 and 480, and then to have it returned to me at your leisure.

Sincerely yours,
ALEX. TAYLOR.

No. 2.

R. & S. No. 152.

INDIA OFFICE;
4th March 1896.

SIR,

I am directed to acknowledge the receipt of your letter addressed to Sir C. Bernard, dated the 29th January 1896, drawing attention to an article on pages 480-81 of the *Indian Forester* for December 1895, and suggesting that any doubts that may exist as to the pension for which Forest Officers are eligible, should be set at rest.

In paragraph 17 of the Forest Regulations, it is stated that the more favourable pension rules have been extended to Forest Officers appointed from England, who are thus on an equality with Public Works Officers appointed from Coopers Hill. The article in the *Indian Forester* points out that in the Public Works Department Chief Engineers are eligible for an additional pension of Rs. 2,000 a year, and Superintending Engineers are eligible for an additional pension of Rs. 1,000 a year; whereas a Forest Officer at the head of his Department is only eligible for an additional pension of Rs. 1,000 a year. And the article suggests that the Forest Regulations do not fairly state the conditions of the Forest service.

It is matter for regret that there should have been a misunderstanding, but the statements in the Forest Regulations appear to be strictly correct. The passage cited appeared for the first time in the Forest Regulations for the examination of 1894. At that time, the temporary concession, granted for special reasons, whereby Chief Engineers were eligible for an additional pension of Rs 2,000 had been withdrawn by Lord Kimberley's despatch of the 21st September, 1893, which directed that "as regards 'those hereafter entering the service, whether in the Public Works, Tele-'graph, or any other branch, the maximum pension should in ordinary 'circumstances be Rs. 5,000 per annum. But in all the larger Depart-

'ments * * * * I authorise you to grant an 'extra pension of Rs. 1,000 per annum, to any officer who shall have 'rendered not less than three years' approved service at the head of his 'Department in any province, and whose special merits you may consider 'to be deserving of such a concession." From the end of 1893 these orders governed the award of pension to recruits thereafter entering from Coopers Hill College, either the Public Works, the Telegraph, or the Forest Department. The Forest Regulations for the examination of 1894 applied to recruits entering Coopers Hill College after that examination; and selected Forest candidates of 1894 and subsequent years will undoubtedly—so long as those orders stand—enjoy the same pension rules as their contemporaries of the Public Works Department.

It has not yet been settled how far a Conservator of Forests, belonging to the first or other grade, shall be treated as head of his Department. When that has been decided, the decision will be published in India, and will be embodied in the Civil Service Regulations.

I have, &c.,

A. GODLEY.

GENERAL SIR A. TAYLOR, G.C.B.

Turpentine from Pinus Khasya.

LETTER FROM J. NISBET, ESQ., OFFICIATING CONSERVATOR OF FORESTS, PEGU CIRCLE, RANGOON.

As it may perhaps prove of interest to Forest Officers and others in various parts of India, I have the honour herewith to forward to you copy of a report kindly furnished by Messrs. Finlay, Fleming & Co., Rangoon, regarding the quality and market value of 30 tins of crude turpentine (resin?) from the *Pinus khasya* forests in the Eastern Circle of Upper Burma.

We have the honour to acknowledge receipt of your letter No. 2544-41-27, dated 9th instant, with reference to the 30 tins of crude turpentine made over to us in Septemtber 1894. We were under the impression that we had passed on to you the reports which our London firm obtained on this turpentine.

The following is from Mr. Boverton Rewood, one of the highest chemical authorities of the day:—

Dark coloured sample—Physical Characters semi-fluid, of grey colour, and having the usual odour of crude turpentine.

Results obtained on distillation.—On being distilled in a current of steam, the sample yielded 29 per cent. of oil of turpentine, leaving a residue of dark red rosin. The oil of turpentine had a specific gravity of ·866 at 60° F., and a flashing point of 95° F. (close test).

Light coloured sample—Physical Characters. (Fluid somewhat viscid) nearly white in colour and with the usual odour of crude turpentine.

Results obtained on distillation.—On being distilled in a current of steam, the sample yielded 25 per cent. of oil of turpentine, leaving a residue of amber-coloured rosin. The oil of turpentine had a specific gravity of 868 at 60° F., and a flashing point of 95° F. (close test).

Results of further examination.—A sample of the oil of turpentine obtained by distillation in a current of steam was found to have a boiling point ranging from 310° to 360° F., and a specific rotatory power of × 32° 36′.

General Remarks.—Even the darker of the two samples yields oil of turpentine of good merchantable colour and odour, and the lighter sample gives a good rosin. The yield of oil of turpentine from both samples is satisfactory, both as regards quantity and quality. The oil of turpentine possesses the same characters as the product manufactured in the United States, having a dextro-rotatory action on a ray of plane polarised light and having a normal density and boiling point.

Judging from these results the oil of turpentine ought to answer all the purposes to which the American product is applied, but I would suggest that in the first instance a few barrels of it should be distilled and a practical trial of it made by converting it into varnishes.

The following is from a London firm of Brokers:—"If imported to this country in the crude state, the stills would have to be erected in an isolated position so as to avoid the risk of fire. To obtain the refined spirits of good colour, the stills would have to be of copper. One of the principal of distillers of rosin here values your crude turpentine @ £4 to £5 per ton, and if he could obtain a constant supply at about this price, he would be willing to go to the expense of erecting plant to work it. This price is based on the present value of American Refined Spirits of Turpentine, £22 per ton. We may mention that during the last few years the price of this article has varied between £20 and £28 in London, and as the market has been going of late, we should consider £24 the highest figure that can be reasonably expected for some time to come. The value of the rosin obtained from our crude turpentine would be from £5 to £6 per ton in London."

The following is from a large firm of varnish manufacturers. 'We have carefully tested the two samples of Indian turpentine with the folllowing results:—

	Dark quality.	Light quality.
Water	18·7	13·0
Spirit	21·3	24·5
Rosin	60·0	62·5
	100·0	100·0

The spirit appears to be about equal to Russian turps, and rosin about F grade. To work it, it would necessitate a special plant being laid down, our rosin stills not being suitable. We are willing to entertain the matter if we are guaranteed a certain supply per annum at a price not exceeding £4-10 per ton on our works."

It is evident from these reports that the turpentine is of good quality, but at the prices named, we fear it would not be possible to ship it at a profit to the London market.

It would certainly be out of the question to ship it in its crude form, to sell at £4-10 per ton—a price which would do little more than cover cost of packing and freight.

Taking the quotations given for the refined products, *viz.*, £24 per ton for spirits of turpentine, and say £5-10 for rosin, and allowing, say, 15 per cent. for moisture, the return would be about £9-6 per ton to cover first cost, cost of refining freight to London and sale expenses.

It you think it worth while, and will give us an idea of the probable quantity obtainable, we shall be glad to ascertain from our London friends the cost of refining plant.

IV.—REVIEWS.

Indian Museum Notes, Vol iv, No. 1.

We were pleased to see this part of a most useful publication, for a rumour had reached us that the 'Museum Notes' were to be discontinued, and we were sorry for it, for in our opinion the notes have been of great value, especially to Forest Officers. Our information regarding the insects which damage the Indian forests is still most incomplete, and Forest Officers who are interested in entomology are few; still, most officers at some time or other come across wood-boring beetles, or defoliating caterpillars, or other pests and wish to know more about them—their names and families and what can be done to minimize the damage they do, and for this the arrangements whereby specimens can be sent to the Indian Museum and then identified, while the record appears in print in the 'Notes' is most useful, for eventually the sum of these notes will go far to furnish what we much require, a Manual of Forest Entomology. The long lists of insects published by the Asiatic Society are probably most useful to specialists and enthusiastic collectors, but are hopelessly dreary and unintelligible to the ordinary observer who is neither one nor the other. This new part (we are not sure that Vol. III is yet completed, five parts have

issued, but no Index) has many notes of interest to our readers. The compound of the Indian Museum, itself, has furnished several interesting specimens—one was *Perina nuda*, Fabr, (Bombyces—Lymantriidæ) a moth which damages the Jack tree; another *Thiacidas postica*, Walk. (Bombyces—Lymantriidæ) which eats the leaves of the Ber (*Zizyphus Jujuba*); another, *Hypsa alciphron*, Cram, found defoliating the Dumar (*Ficus hispida*); and another, *Parasa lepida*, Cram. found destructive to Ashphal, *Nephelium Longana*. As an example of what Forest Officers can do in the way of observation of scientific value, the following extract will be read with interest:—

"In July 1894 the Director of the Imperial Forest School, 'Dehra Dun, forwarded specimens to the Indian Museum of the 'larva, chrysalis and perfect insect of a moth (*Microlepidoptera*) 'which has been doing considerable damage to the Himalayan 'spruce fir (*Abies Smithiana*) in the Jaunsar forests. The moth 'appeared to be new to the Indian Museum collection, so has 'been sent to Europe for precise identification.

'A single specimen of an Ichneumonid fly was also forward-'ed which may probably be parasitic on the caterpillars of this 'moth.

'The following note has been furnished by Mr. C. G. Rogers, 'Deputy Conservator of Forests:—

'While in camp at Konain in April last (1884), I noticed 'that the last year's shoots of small spruce saplings had been injur-'ed by something, as they had not developed at all. On examin-'ing several of these injured shoots, I found the empty chrysal-'ides of an insect which proved that the injury had been done by 'an insect and not by a fungus. The needles of the shoots were 'united by a silky tissue, and the points of such needles as were 'still on the branch were tied together by the silky threads above 'referred to. At Bodyar, in the beginning of June 1894, I noticed 'that some of the young shoots (this year's), which were just 'developing, were not normally developed, but that after develop-'ing in length for about ½ or 1 inch, the whole of the needles 'were formed into a pointed ovoid body, the free ends of the 'leaves being bound together so as to form a case. On examin-'ation it was found that the needles were bound together with silk 'threads, and that in the protective covering thus formed around 'the developing bud was the larva of an insect."

'The protective covering made of the needles, which have 'already developed, is on an average 2 inches long, ¼ inch broad 'at the centre, and has very tapering ends."

'One specimen of this protective covering is sent. The 'further development of the bud is prevented by the covering of 'needles, which surround it on all sides, and the larva feeds on the 'tender partially etiolated leaves, which are developed inside the 'covering of full-grown needles.

'A number of shoots containing larvæ were examined on the 7th June. The average length of 13 larva was 0·31 inches and 'the average width 0·05 inches.

'"The colour of the larva is pale yellowish-white, the skin is 'transparent and the green colour of the young needles, which it 'has been eating, is very distinctly visible down the centre of the 'body of the insect. The larva is slightly hairy and very irrit-'able when touched. It can give out a thin line of silk from its 'mouth and can suspend itself by this when it wishes to do so. It 'unites the outer and furthest developed leaves of the young shoot 'by silk threads in order to form a protective covering for itself, 'and the developing bud on which it feeds. The eggs of the 'insect were not found, but with one exception only one larva 'was found in each case."

'The buds, as a rule, had grown about ½ inch or 1 inch in 'length and sometimes more before their further development was 'stopped by the larva.

This seems to point to the egg being laid in the bud at the 'end of a terminal or side shoot in the rains or autumn; and to 'the egg (a solitary one) being laid in the middle of the bud, 'or at any rate not at the base. Some leaves are developed before 'the egg is hatched, and the larva emerges. It should be noticed 'that the bud scales, which form the protective covering of the 'bud during the winter are pushed off as a whole by the develop-'ing bud, and thus keep the free ends of the needles together, and 'it is only when the young shoot has developed to some extent 'from 1 to 3 inches that the bud scales fall off or are pierced by 'the needles of the young shoot. This method of development 'no doubt helps the larva to make his protective covering.

'The chrysalides, which were gathered about the second 'week in June, developed into moths in the beginning of July. 'The exact dates cannot be given.

'One larva, which turned into a chrysalis on the night of 'the 7th-8th June, is not yet a moth (7th July), so that they 'probably take a month on an average to develop from the 'chrysalis to the moth.

'The chrysalides seem to be very constant in length. The 'average of five measured was 0·25 inches. The wing cases, 'antennæ, and eyes of the moth are clearly visible in the 'chrysalis.

'The wing cases are about half as long as the whole 'chrysalis, which is light yellow when young, but matures to a 'light brown.

'The abdominal portion of the chrysalis shows seven seg-'ments. Three of these lie between the wing cases and the 'remaining four are quite clear of the wing cases.

'Each segment has two rows of small prickle-like protuber-'ances on the back of the chrysalis parallel to the segmental 'divisions of the body and close to the upper end (the one 'nearest the head) of the segment. One of the chrysalides 'examined on the 7th June was found to contain the chrysalis 'of a fly. It was 0·23 inches long, and was transparent, so that 'the fly could be seen inside.

'The fly was hatched during the night, and is sent in the 'tube with the larva and chrysalides.

"Afterwards several other protective coverings were found 'to contain the same flies. The flies emerge from their chry-'salides before the larva of the moth are fully developed. The 'chrysalides of the flies are found attached to the upper end 'of the protective covering, while the chrysalides of the moth 'are attached by a silk thread to the lower end of the same 'covering. I could not discover that the flies interfered with 'the development of the larva of the moth. This moth seems 'common in the Jaunsar Forest Division, wherever the spruce 'fir is found, as signs of its presence were found at Deoban, 'Bodyar, Konain and Mandali.

'It does not confine its attacks to small trees, but 'attacks large trees as well as small poles and saplings, and 'together with the fungus *Æcidium abietinum* (Barclay) does very 'serious damage to the spruce.

"The fungus and moth are commonly found on the same tree, and at Bodyar I found a young sapling growing in the open, 'and therefore favourably situated as regards the amount of light 'which is necessary for its normal development, very seriously 'injured by the larva of this moth. Nearly all the young shoots 'were attacked, including the leader, and nearly all the shoots 'which were not attacked by the moth were infested with the 'fungus above mentioned. The larva also attacks very readily 'small saplings of spruce in the advance growth and also saplings 'and poles which are suffering for want of light, and by so doing 'materially shortens their lives.

"The moth confines its attentions, so far as was observed, to 'the spruce only, and does not attack the Deodar or Silver fir '(*Abies Webbiana*) which are usually associated with it.

"In a pure spruce forest, more particularly a young one, this 'moth would undoubtedly develop into a very serious pest, and 'might endanger the very existence of the wood.

"It is at present very common in Jaunsar, and besides affect-'ing the rate of growth and production of wood of the larger trees, 'does undoubtedly help to shorten the lives of saplings and poles, 'which are already dominated and suppressed. The direct effect of 'the larva of the moth on the growth of the tree and its increase in 'volume of course depends entirely upon the number of buds attack-'ed; where only a few shoots are attacked, the effect is very small

'and probably inappreciable, but where the majority of the buds of 'a tree are attacked, the effect on the increase in volume of the tree 'and its general health and vigour cannot but be a serious matter."

The following extract will be of interest to Burma Forest Officers, though it is a pity that the name of the insect could no be ascertained.

"Specimens of caterpillar of a boring moth, together with 'pieces of teak wood bored by them, have been received from Mr. 'F. J. Branthwaite, Prome District, who wrote in December '1894:—

"When visiting some plantations of teak this morning plant- 'ed in the Prome Division in 1892, in company with the Conser- 'vator, Pegu Circle, and the Deputy Conservator of Forests, 'Tharrawaddy, we noticed that several of the young trees were 'attacked by some larvæ, two specimens of which are herewith sent.

"Specimen No. 1 shows how entry is effected into the young 'trees. It is made at about one inch above the ground. Round 'the entrance was a heap of the excreta of the larvæ.

"Specimen No. 2 shows how the larva bores down the tap 'root.

"Both when found were alive and of a dirty cream colour 'with brown heads.

"The plantation where the larvæ were found was one planted 'in lines 12 ft. by 3 ft. the space intervening between the lines 'being overgrown with a fairly thick growth of various grasses."

"It is quite impossible to identify this insect precisely from the 'specimens received, but it may probably be one of the Hepialidæ, 'a group of moths well known to contain numerous wood-boring 'species.

The following is interesting as a commencement of investigation of the Indian species of Bostrichidæ. We hope that the beetle itself has been sent to a specialist, and that in a late number we shall find its specific name recorded.

"In August 1894 some specimens of a Bostrichid beetle were 'sent to the Museum by Mr. A. Smythies, Officiating Conservator 'of Forests, Shillong, with the information that they were found 'boring into tea-box planks at Tezpur, where they are locally 'called *Ghong*.

"The insect proved to be identical with the specimens named '*Sinoxylon* sp., previously sent to the Meseum, as infesting the 'wood of *Terminalia belerica*."

So, too, in reference to the next extract which we quote, we hope the Punjab Forest Officers will find and identify the beetle which has taken so kindly to two introduced trees.

"In June 1894 specimens of a caterpillar found destructive 'to young seedlings of *Robinia* and *Albizzia* were forwarded by 'the Director of the Imperial Forest School, Debra Dun, from the 'Divisional Forest Officer, Chenab, with the information that the

'caterpillar is said to live about nine inches below the ground, and 'cutting through the tap root of both species, feeds upon the pulpy 'portion of it.

"The specimens proved to be the larvæ of a Cerambycid beetle, 'the material being insufficient for precise identification."

The last extract which we purpose to quote is interesting from its bringing forward as a destructive insect, one of a class and family which is not usually supposed to be capable of any harm.

"In May 1894 specimens were forwarded to the Museum 'through the Director, Imperial Forest School, Dehra Dun, from 'Mr. H. O'Neill, of insects which were said to be most destructive 'to vegetable and flower gardens in Caber hills. Mr. H. O'Neill 'writes :—

"One specimen you will find in the bottle to be like pieces of 'thread, and it was with the greatest difficulty that they could be 'picked out of the earth. They crawl out of the ground at night 'and devour all the tender shoots and blossoms of flower and 'vegetable plants. They are also most destructive to potato crops. 'I have observed them attack wheat and garlic as well. This 'year they have destroyed fields of wheat and garlic on the 'upper Caber hills."

"The insects consisted of numerous little millepedes of the 'Julid family, which however proved to be new to the Museum 'collection."

"The millepedes are well known to live on decaying vegetable matter and occasionally on decaying animal matter, but so 'far as is known, they have never before been reported to be pests 'to agriculture in India. Indeed, the little that is known of them 'in relation to agriculture and forestry is favourable, as they are 'said to occasionally feed on slugs and snails. In consideration of 'these facts, further particulars on this interesting subject are 'desirable. Specimens have been forwarded to Mr. R. I. Pocock for identification.

V.—SHIKAR AND TRAVEL.

A Novel Fishing Expedition in Burma.

Some time ago I accompanied a party of Burmans on a novel fishing expedition up one of our small rivers, and as the experience was a new one to me, as it will be probably to a great many of your readers, perhaps the *modus operandi* of landing the fish,

and an account of the day's sport will be of some interest.

A suitable spot is selected, generally a deep pool, where there is little or no current, and where the bed of the stream gradually shelves upwards towards the opposite bank. A long rope of nearly the width of the stream, and through the strands of which the newly developed white leaves of the toddy palm (*B. flabelliformis*) have been passed, is then weighted with boulders and laid down across the stream and at the edge of the pool. A bamboo raft about 10 ft. broad is then brought and placed exactly over this rope. A second rope, similar to the one above described, is then taken up stream for about a quarter of a mile in a boat by four or five men. This rope is then, after being weighted, let down on to the bed of the stream and has a long bamboo attached at each end and held by two men, and is gradually dragged along the bed of the stream towards the pool. The remainder of the men in the boat being armed with bamboos beat the surface of the water, throw stones and shout, and thus gradually drive the fish before them to the pool. On arriving at the pool, the second rope is fixed one end to bank and the other made to overlap the end of the first rope, thus forming a triangle with the bank as a base and enclosing the pool. And now the fun begins. The fish, finding themselves thus confined, swim about uneasily and try to jump over the raft, which being too broad for them to clear, they are at once secured by men stationed on the raft. The strange part of the thing is that the fish will on no account swim over the ropes lying on the bed of the stream. Two kinds of fish are found here, both scaleless, the *Nga-kyoung* or cat fish and the *Nga-bat*, and strange to say it is only the latter that tries to escape by leaping out of the water, the *Nga-kyoung* never by any chance makes the attempt. After the fish have quieted down a bit, the second part of the performance begins. This consists of men diving into the water and securing fish after fish by striking them with a huge hook about 18 in. long, the top bent and barbed like an ordinary fish hook. To the hook is attached a rope about 3 ft. in length, and the end secured to the wrist. When the men are ready, about four at a time dive under the water and swim about in different directions, and a fish coming within striking distance is immediately secured by a quick strike of the hook. As soon as the fish is fast on the hook, the man lets go of the hook and comes to the surface when the rope is released from his wrist and the fish secured. In this manner some 40 fish, varying from 10 to 40 lbs. were secured in a few hours by a party of ten men. The men on an average can keep under water for 25 seconds, and an old fellow who has been at it for some years, could prolong his stay to 35 seconds. It is only during the winter months when there has been no rain in the hills that this sport can be indulged in, as then the water is beautifully clear. The men pay Rs. 20 per annum for the right of fishing, but they do not sell what they catch,

merely catching enough for home consumption. The above is the only method by which these two fish can be secured here as they will not take bait of any kind. There are Mahaseer also in the stream, but their scales are proof against the point of the hook. There ought to be some good Mahaseer fishing in the higher reaches of the stream, and I hope to visit the grounds at some future date.

TAW-SEIK.

VI.—EXTRACTS, NOTES AND QUERIES.

Louis Tassy.

The *Revue des Eaux et Forêts* of the 10th January has a long notice on the late M. Louis Tassy, Honorary Inspector-General of Forests, who lately died in his eightieth year at Aix-en-Provence, after a long (40 years) and very distinguished career in the Forest Service of France. His was evidently a most strenuous life, devoted altogether to duty, and although his character was a very amiable one, a good deal of controversy surged round his writings. These writings were a great feature of his life, for they were both numerous and finished. They seem to have been exclusively professional, and M. Tassy seems to have thrown himself into them with his whole soul. He forms a link with the early days of true systematic Forestry in France, for his day dates from that of Parade.

M. Tassy was born in 1816 at the place where he has just died, and the peculiar impressions made on him by his own beautiful land of Provence seem to have affected him all his life; as the writer of the obituary notice picturesquely puts it, M. Tassy's clear, orderly and harmonious spirit was like the bright, clear air of the land of his birth. M. Tassy had every chance for he came of cultured and estimable parents, the friends of famous persons.

Tassy joined the Nancy School in 1836, in the thirteenth promotion. The school was young then, but the spirit that was in it was an excellent one, and the Foresters of those days were full of hope and love of their grand profession—and these, we think often do more for a man than a highly systematic teaching. Parade became Director in 1838, and Parade inspired in Tassy a great and ever-growing admiration, which was reciprocated by the famous professor. With Parade too, was then associated the late M. Mathieu, known to so many of ourselves.

The warm heart of Tassy led him to form deep and lasting friendships at Nancy. Adolphe Lorentz, whom he met first there, was through life his great friend and helper.

The life after Nancy was a very varied one. It was passed, to begin with, at Sarreguemines and St. Laurent du Pont, but perhaps may really be considered to have begun in the forests of the Grande Chartreuse, under the distinguished M. Buffévent, who highly appreciated the young energetic Forester. In 1843, Tassy was sent to the Working Plans Branch, and took keenly to this work, as his writings on the subject shew. In 1846 he was called to the Central Secretariat, and in 1849 he went to Dijon.

Thereafter a great and novel field was opened to him, for he won the chair of Sylviculture at the new Agricultural College at Versailles, and was thereby enabled to extend to the public generally, or at least to the agricultural public—a knowledge of forestry. When we recollect the great extent of forest owned by private proprietors in France, we can realize how great an influence this meant. For this work, M. Tassy was by his breadth of mind and his powers as a lecturer thoroughly well fitted. Although this school was abolished in 1852, the effect of Tassy's teaching was still alive when the school was again started in 1876, when Tassy was once more appointed to his old post.

On the closure of the Versailles School, Tassy returned for a time to the Secretariat, but was in a few years, at the close of the Crimean War, called away to form one of a Commission sent to Turkey to see what could be done to utilize its natural resources. This work required a good deal of skill, but Tassy acquitted himself excellently, and was accorded the Legion of Honor in recognition.

He was recalled shortly afterwards and became for a time Conservator of Corsica (1862) but his heart was in his half-finished work in Turkey, and he returned thither in 1865.

From that date (1868) he worked vigorously with the assistance of four officers, four "Brigadiers" (Foresters) and some of his old Turkish pupils. We wonder how much of the goodly fabric thus raised still remains in that unspeakable land. For a time, however, it is clear Tassy's good work was appreciated, for the Ottoman Government tried hard to get him back again a few years later.

Thereafter Tassy became Conservator at Vesoul, and "Vérificateur-Général" of Working Plans, a post requiring much tact, which was amply shewn. It was *the* work for Tassy, and Tassy *the* man for it. The chief feature of it was the continuation of that big business, the conversion of coppice into High Forest, which has proceeded steadily now for a long time.

Then came (1872) special duty in Algeria, and on Tassy's report the system now in force there is founded. In 1875 he retired from the Forest Service.

In 1876, the Versailles School was again established and Tassy re-appointed. He remained in his old post till 1884 when he finally retired.

His chief writings are "Etudes sur l'amènagement des forêts," "Report on Algeria," and several pamphlets. He was one of the founders of the *Revue des Eaux et Forêts* He wrote also vigorously on the subject of the reorganisation of the Forest Service, with which he had much to do in his last years of service.

Tassy passed the last nine years of his life in seclusion. He appears to have been a thorough Forester at heart, full of keenness and energy. Such men are the life blood of a Forest Service.

Remedies for Plant Diseases.

The following are some reliable formulæ for the treatment of fungi and insect pests. They have been taken from the Report of the Agricultural Experiment Station of the University of California, and are reprinted here for the benefit of the many inquirers in this country to whom the original reports are not, perhaps, accessible. It should be very constantly borne in mind that "Paris Green" and "London Purple" contain the powerful poison, arsenic, and should therefore be used with the greatest caution, especially in the case of plants, any part of which is used in the preparation of food or drink. The same caution applies, though with less emphasis, to "Bordeaux mixture," which contains an irritant copper salt.]

For powdery mildews use sulphur, dusting it on the plants.

For fungi in general use Bordeaux mixture, made as follows: For every 10 gallons take 1 pound of lime and 1 pound of bluestone. Dissolve these separately in hot water and mix when cool, adding the rest of the water. Spray on the plants. Or spray with ammoniacal copper carbonate solution, made as follows: Dissolve 1 ounce of copper carbonate in 6 ounces of ammonia and add 10 gallons of water.

For fungi and scale insects use lime, salt and sulphur mixture, a *winter* wash composed of lime 8 pounds, salt 3 pounds, and sulphur 4 pounds, for each 12 gallons of water. Mix one-fourth of the water, one-fourth of the lime, and all the sulphur and boil for one and-a-half hours; put the salt with the rest of the lime and slake with hot water; add to the above and boil half an hour longer; add the remainder of the water and apply as a spray.

For scale insects use resin soap as follows: For 100 gallons for *summer* use take resin 18 pounds, caustic soda (98%) 3½ pounds, and fish oil 2½ pints; for *winter* use, resin 30 pounds, caustic soda 6¼ pounds, and fish oil 4½ pints. The material is put in a kettle and covered with four or five inches of water. The lid is put on and the mixture boiled two hours or more, and then the rest of the water is added, a little at a time. Spray

on the plants. Or use the gas treatment: Cover the plant with an oiled tent, and for each 100 cubic feet of contents place in a bowl beneath the tent ⅔ ounce of water, ·⅓ ounce of sulphuric acid (oil of vitriol), and ⅓ ounce of potassium cyanide (58%). Be careful not to inhale the poisonous gas, not to allow it to escape from the tent for half an hour. The leaves may be injured if used during the middle of the day.

For insects in general use kerosine emulsion, as follows: Make a soap solution of half a pound of soap to a gallon of water. Heat it to boiling and add two gallons of kerosine. Pump it through the spray pump, with good pressure, for five or ten minutes. For use add ten times as much water as you have of emulsion. Apply as a spray. Sour milk may be used instead of the soap solution. The emulsion is made more effective by the addition of a very small amount of arsenic to the soap solution, or of buhach to the kerosine.

For fruit or leaf-eating insects use Paris Green or London Purple as a powder at the rate of 1 to 5 pounds to the acre, distributed by walking or riding over the field, carrying a pole, at both ends of which are hung muslin bags containing the poison. As a spray use 1 pound to 200 gallons of water. In spraying these arsenites, the nozzle should be held at some distance from the plant and *no more should be applied after the leaves beyin to drip*. Do not use these on crops where the poison would be injurious to health.—(*Indian Museum Notes, IV, 1.*)

The Forests of the United States.

The Secretary of the Interior has set on foot an investigation of the forestry problem which is sure to produce results of large interest and value, and which it may be reasonably hoped will lead to the adoption of a wise policy of forest administration by the United States. And whether this hope is destined to be realized or not, it is no more than just to say that Secretary Smith deserves hearty commendation for undertaking an important task in the right way. In response to his request the National Academy of Sciences has appointed a commission to study the subject in all its bearings and to make a report answering certain specific questions. The men selected for this work are admirably qualified to perform it. Indeed, they constitute an ideal commission. They are Professor Charles S. Sargent, Director of the Arnold Arboretum; Mr. Alexander Agassiz, formerly Curator of the Natural History Museum at Harvard; General Henry L. Abbot, of the Army Engineer Corps, retired, our leading authority on rivers; Professor William H. Brewer, the eminent Yale botanist and agriculturist; Mr. Arnold Hague, of the United States Geological Survey, and

Mr. Gifford Pinchot, who is in charge of the great undertaking in practical forestry which Mr. George Vanderbilt is conducting on his Southern estate, and who has perhaps had a more thorough training in forest cultivation than any other American. One needs only such knowledge as every intelligent person ought to possess of what these men have done in their several fields of activity to realize the advantage which the country may derive from their co-operation in the inquiry which Secretary Smith has instituted.

The commission is asked to determine whether it is desirable and practicable to preserve from fire and to maintain permanently as forested lands those portions of the public domain now bearing wood growth for the supply of timber; how far the influence of forest upon climatic soil and water conditions makes desirable a policy of forest conservation in regions where the public domain is principally situated; and what specific legislation should be enacted to remedy the evils now confessedly existing. It will be seen that the whole case is included under these three heads. The commission will probably be expected to answer the first question broadly in the affirmative, and to report in favor of a National policy of protecting the wooded domain of the United States; and there is every reason to trust its sagacity for a safe guide toward practical legislation. The investigation is proposed at an opportune moment, inasmuch as the Commissioner of the Land Office has apparently been induced to approve the plan of stripping the great Cascade forest reservation of Oregon, and the whole Sierra preserve is in danger. It is a cause for deep gratitude that experts whose disinterestedness is as complete as their scientific equipment have consented to perform so necessary a task.

There is no need to say again that the forest wealth of the United States has been lamentably wasted, and that we are already suffering seriously from conditions which must inevitably grow worse so long as they are neglected. At the same time it is not strange that this state of things should have come to pass. Even observers of superior intelligence have only recently begun to realize that the vast forest endowment of the country was not inexhaustible. It naturally seemed so to many successive generations. The woods not only appeared to early settlers, and to the host that was for ever migrating westward, to be an obstacle which must be removed, but actually to a great extent were just that. A clearing was the first requisite for immediate comfort and material advancement. Whoever cut down a tree was regarded as a pioneer of civilisation and a public benefactor. To this day, it must be acknowledged, though an understanding of the truth has developed rapidly of late, there is widespread indifference to the proofs of enormous losses already sustained even in the State of New York, where an active propaganda for the preservation of what is left of the North Woods has been going on for many years,

Of course selfish interest is usually able to make a winning fight when a majority are not aware of what the common welfare demands, or sluggish in the defence of their rights. But it cannot be doubted that the people of the United States will comprehend, sooner or later, the magnitude of the sacrifice which they have encouraged and the disaster which they have invited. That day of general knowledge and of consequent determination to rescue and save the fragments of a superb National possession may be hastened by the commission just called into existence. We earnestly hope that this will be a chief consequence of its labours, and it is reasonable to believe, though the leaven may continue to work slowly among the masses of the people, that this investigation will stimulate the intelligence and conscience of the Government and so bring about the adoption of a sagacious forest policy. —(*New York Daily Tribune*).

Colonial Timbers for Wine-Casks.

I draw attention, in a tentative way, to the subject of indigenous timbers for cask (and particularly wine-cask) making. The subject is not free from difficulty, for in Europe the best woods for casks have only been found out as the result of many experiments and long experience. Ours is a new country, and we cannot gain experience in a moment ; moreover, money is not sufficiently plentiful to enable one to risk the quality of a large quantity of wine in trying experiments on many timbers. But with our admittedly wonderful variety of native timbers, it would be a most extraordinary thing if we have not among them some timbers which satisfy all the desiderata of a good wine-cask. I would go further, and say that such a thing must be impossible. So much being premised, we want to find the best timbers for the purpose. I proceed to give a few notes in regard to timbers most of which have been more or less tested for wine-cask making. I hope it may be suggestive, and that it may result in the Department being furnished with hints on the subject by vignerons, coopers and others. The Department is only too anxious to aid the important wine industry of the Colony, in helping those engaged in it in regard to this very important question. There ought to be no insuperable difficulty in having small casks made of various woods, and wine placed in such casks, to be examined by experts in the subject.

Mr. Hubert de Castella, the well-known Victorian vigneron, in giving evidence before the Vegetable Products Commission of that Colony states, "I do not think lightwood is a very good wood for casks ; it give a slight taste ; I tried lightwood ; I had thirteen large casks made from lightwood, and we exchanged them for oak. Even after a year or two, and wine had been in it, we thought it gave a slight taste to the wine—an oily taste."

Subsequently, Mr. de Castella said, "On a former occasion I made a few remarks on casks, a subject which is of the greatest importance to the wine industry of this country. I was in hopes that this might have provoked some discussion, but in this I have been disappointed; and now again I venture to urge the importance of the matter.....I have used blackwood since 1863, and found it in every respect equal to oak. By blackwood I do not mean what is often supposed to be the same, namely lightwood, which is utterly unsuitable for wine, though good enough for tallow .... Mr. Ransome, one of the judges of Australian timbers at the last London Exhibition, recommended mountain ash as suitable for cooperage; and I have been told that this wood is largely used at Albury. There again a vast difference must be made in favour of what is called blackbutt, which is quite different timber from the mountain ash, as between blackwood and lightwood.....When I first began to make the casks, oak was the only timber supposed to be used. There was not a plank of oak in all the Colonies. Mr. Higginbotham was making railway carriages and he said 'Why not use blackwood, as we do in the Railway-works?' and I got a couple of planks and make a cask of 130 gallons, and I made big casks, 1,500-gallon casks, and it is an excellent wood. And then the mountain ash has to be tried. There is some prejudice against those things. In England some people say they will not have the wine in any cask except Baltic oak ..... I asked, when I was buying staves, whether there was any difference between blackwood and lightwood, and the timber-merchant showed me that if you cross-cut the wood, the blackwood is as hard as horn, and the lightwood porous. As the cooper puts his mouth to it his breath comes through. The one is useless for wine and the other is excellent, but the coopers do not know that generally."

As regards the blackwood and the lightwood of which Mr. de Castella speaks, I would invite my readers to the article on blackwood in the *Gazette* for March, page 129, where the subject is discussed, so that I need not repeat myself here.

Speaking of mountain ash, Mr. H. de Castella says, "I have tried to put new wine in mountain ash, which is a very good wood; it has not given any taste to the wine except those casks being made by a cooper who bent the staves with fire, the mountain ash, from being charcoaled a little inside, gave a slight taste."

Mr. de Castella speaks highly of mountain ash, and even more highly of blackbutt. Now the mountain ash is probably that very tall Victorian tree which is botanically ranked under *Eucalyptus amygdalina*. This is best known as an oil-yielding species; but it may be *Eucalyptus Sieberiana*, which is well known is New South Wales as a mountain ash. It has a bark which at a little distance may be mistaken for an ironbark, but the branches are, unlike those of ironbarks, perfectly smooth. It is common

in cold mountain regions, chiefly in the southern coastal districts. Whether this is the mountain ash referred to by Mr. de Castella or not, it is a grand timber, pale coloured, an excellent splitter, and a sound, durable, strong timber. I would strongly recommend that it be given a thorough trial for wine-cask making.

Again, it may be a mountain ash sometimes known as white ash which is found in the highest mountain ranges in the direction of Candelo to Kiandra, and the extreme southern portion of the Colony generally. This is a beautifully clear, straight-grained, white timber, which is at present brought to Sydney in small quantities as a substitute for American ash, and it is used to some extent for bed-room furniture. At present it costs a good deal for carriage, but it is a first-class timber and is, I should think, likely to be eminently suitable for wine casks. If the matter be inquired into, I have no doubt we shall find this timber in more accessible localities.

As regards the blackbutt, if Mr. de Castella is reported aright it must be our old Sydney friend *Eucalyptus pilularis*. But if you want to see really fine blackbutts go to Termeil, between Ulladulla and Bateman's Bay, and other localities on the South Coast. There you will find very giants, both as regards height and girth, and they will split as straight and as true as good stringybark.

But, to return to Mr. de Castella's evidence, it is not perfectly clear, because of the use of vernacular names. I have shown that there are various mountain ashes and when he speaks of blackbutt, it is quite possible that he is speaking of a very black-butted mountain ash, such as *Eucalyptus Sieberiana*, in comparison with the smooth barked mountain ash known to botanists as *Eucalyptus amygdalina*. When the use of vernacular names (particularly in regard to Eucalypts), causes a feeling of uncertainty as to the timber referred to, is it a wonder that botanists look forward to the millennium, when everybody will use botanical terms for the purpose of designating timbers, because the advantages of their use are so evident? That botanical names are hard to get hold of is a popular error as erroneous as it is widespread.

Mr. William Graham, also giving evidence before the Victorian Royal Commission of Vegetable Products, says :— "The native woods seem to be very good for wine casks, but we have not tried them to any extent. I think blackwood is the best colonial wood for casks. Mountain ash has been used, and has been fairly successful, but not to any great extent. Casks from Tasmanian silver wattle look very well."

It will be observed that both Mr. de Castella and Mr. Graham appear to think that blackwood is the best colonial timber for wine casks. Small blame to them, for they are Victorains, addressing a Victorian Royal Commission, and blackwood is a common timber far better known in Victoria than in this Colony. We have a far better assortment of timbers than

our good friends over the Murray, and surely we do not lack the enterprise necessary for taking advantage of our good fortune.

Mr. Graham cautiously refers to casks of Tasmanian "Silver Wattle" as *looking* very well. I am afraid we want something else in wine-casks than good looks; but if anyone in New South Wales wishes to try silver wattle we have plenty of it. Its botanical name is *Acacia dealbata*. Other New South Wales wattles I would like to draw attention to in this connection are the black wattle with broad, two-veined leaves (phyllodia), whose botanical name is *Acacia binervata*. It is plentiful in the coast districts, grows to a large size, and the mature wood is dense. Then we have the mountain hickory, which is abundant in the mountainous districts of the South. It attains a large size and its timber is an excellent substitute for the true blackwood. Its botanical name is *Acacia penninervis*. Then I would doubtfully suggest the brigalow (*Acacia harpophylla*) of which a good deal is to be found in the Narrabri District. It is a dense, valuable timber and might be tested by the wine-growers along the Northern line of railway.

Perhaps the New South Wales timber which has been spoken of more than any other for wine-casks is the silky oak (*Grevillea robusta*), which grows in northern brush forests. At one time it was far more extensively used for tallow-casks than it is now, but a number of experiments have been made with the view to give it the more dignified employment of wine-storage. Mr. Thomas Hardy of South Australia placed shavings of this wood in light wines for two months without affecting the taste and colour of the latter. He pronounced the wood suitable in other respects; and therefore suitable for casking wine. The opinion of an authority so eminent must carry great weight, and I am therefore surprised that I have not heard of the matter being followed up during the last three or four years. Silky oak would not leak when split on the quarter, and Mr. Hardy has been instituting inquiries as to whether the staves would leak when the wood was cut across the grain. I have not heard the result of these inquiries. Mr. Charles Moore, Director of the Botanic Gardens, pronounces silky oak too porous to hold such liquids as spirits.

Now that *Grevillea robusta* is getting scarce, I would like to draw public attention to what I believe to be a perfect substitute for it. The commonest tree in the Dorrigo Forest Reserve is one known to botanists as *Orites excelsa*, and its wood usually passes as silky oak. I examined the timber carefully in the forest, and brought a few pieces to Sydney. Everybody I have shown them to pronounces them to be silky oak. At the present time, if there is any difference between this *Orites excelsa* timber and that of *Grevillea robusta*, I do not know what it is, and it is evidently not of a superficial character. I was pleased to make this discovery, as there is a perfect mine of this silky oak in the

Dorrigo. There are millions upon millions of feet of it, and at present not a stick is used. But even if it be not used for wine-casks, the time will come when it will be used for butter or tallow-casks, or for some other humbler yet useful purpose.

I desire now to draw attention to a timber for wine-casks which I had not thought of for the purpose until Mr. Thomas Bawden, of Grafton, kindly brought it under my notice. His remarks on such a subject demand respect, for, as is well known, he has given a good deal of attention to the utilisation of our native products during the last thirty years and more. Mr. Bawden says: "With regard to wine-casks, and the proper wood for the purpose, I think you will find rosewood the very best. I know some years ago the late Richard Bligh had some large vats and casks made of that timber, which suited admirably, and certainly gave no taste to the wine. I yesterday asked an old wine-grower of large experience what he thought best for wine-vats or casks, and he at once selected rosewood, as giving no taste of a deleterious character to the wine. He has tried silky oak, but has condemned it, and has not been able to get anything better than rosewood. I replied expressing doubt whether an odorous wood, of the nature of rosewood, would not affect the bouquet of wines stored in it. In a recent letter Mr. Bawden writes: "With regard to the rosewood for casks, I have the assurance, in addition to my own large experience, of one who has been engaged in wine-making in this district for the past thirty years, that the wood does not give any taste to the wine. Might I suggest an experiment of a small piece of seasoned rosewood placed in a bottle of wine for a few months? Should the rosewood turn out as I believe it will, there are large quantities of it in this district." I venture to express the hope that those who have tried rosewood for wine-casks will relate their experience, and that those will test it who have facilities for so doing and have not yet done so. It is high time that such an important matter were settled. The botanical name of the rosewood referred to is *Dysoxylon Fraserianum*, and I should also like to see exhaustive tests made of the red bean (*D. Muelleri*) which may be described as a scentless rosewood. Who will take the matter up? In the Dorrigo Forest Reserve (not to mention other northern forests) there is an enormous quantity of mature rosewood, and at the present time an axe is never put in it. Just now things are so bad with the unfortunate timber getters, that rosewood may be had at a very low rate. It behoves patriotic people to do their level best to encourage the use of colonial timbers. At present a timber is looked askance at, in many quarters, simply because it is colonial. But this should not be. Surely an educated public is discriminating enough to know a good timber and value it on its merits.

This article is already of sufficient length, and I will therefore content myself by alluding to only one more timber. I have heard native beech (*Gmelina Leichhardtii*) spoken of in the highest terms as an excellent timber for wine-vats. Is there any drawback to its use? If so, what is it?

And if all these timbers I have mentioned be found unsuitable for wine-casks, I will mention some more, for if public spirited men can be found to thoroughly test the timbers, I am determined that they shall not lack likely woods to experiment upon.—(*J. H. Maiden, in Agricultural Gazette, N. S. W.*)

Obituary, Mr. F. J. Thellusson.

The following is extracted from the *Pioneer* :—

RANGOON, *27th April.*

"Mr. Thellusson, Deputy Conservator of Forests, in charge of the Rangoon Division, while driving from the Government Timber Depôt at Ahlon to Rangoon this morning was thrown from his trap, receiving injuries from which he died two hours later. The pony shied at something on the road and collided with a lamp post, Mr. Thellusson being thrown on his head. Some Burmans picked him up and medical aid was summoned but without avail. A sad feature in connection with his death is that his wife and child left on Saturday afternoon for England, and Mr. Thellusson proposed shortly to follow them."

We feel sure that our readers will join with us in regret for this sad occurrence and in sympathy with the family of the deceased officer, who was very popular and had many friends in the Department. He was educated at Nancy and joined the Department in the beginning of 1878, so that he had nearly 18 years' service. The whole of his service was spent in Burma, where he was known as an excellent officer and where he had more than once officiated as Conservator, an appointment to which he might naturally have expected to be very soon permanently promoted.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

2nd April 1896.

EAST INDIA TEAK.—The deliveries for the first quarter of 1896 amount to 5,758 loads as compared with 1,926 loads for that period of 1895. March 1896, is accountable for 1,315 loads against 749 loads in March, 1895. There has been no accumulation of stock during the month in London, but general consumers are slow to follow the greatly enhanced cost of this wood, and a dull tone has prevailed in the market which, however, is more apparent than real.

ROSEWOOD.—EAST INDIAN.—The demand continues quiet and no sales have been made, stocks are small but quite sufficient.

SATINWOOD.—EAST INDIA—Is rather quiet, but stocks are very light.

EBONY.—EAST INDIA.—Good wood in small parcels would find buyers at quotations.

PRICE CURRET.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£6	to	£10
Satinwood	„ sup. foot	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, April, 1896.

Cardamoms	per lb.	1s. 5d.	to	1s. 9d
Croton seed	per cwt.	47s. 6d.	to	50s.
Cutch	„	17s	to	32s. 6d.
Gum Arabic, Madras	„	16s.	to	33s. 6d.
Gum Kino	„	£20	to	£25.
India-rubber, Assam	per lb.	1s. 10d.	to	2s. 1½d.
„ Burma	„	1s. 4d.	to	1s. 11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.
„ Jubbulpore	„	3s. 9d.	to	6s.
„ Godavari	„	2s. 6d.	to	4s. 6d.
Nux Vomica, good	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	„			
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	70s.	to	95s.
Tamarind	„	6s.	to	7s.

Statement of average selling rates of timber and bamboos in Cawnpore, Moradabad, Bulandshahr, Pilibhit, Delhi and Bareilly, for the month of March 1896.

Description.	Timber scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
CAWNPORE.					
Sâl, 10′ Tors (Poles) ...	3 4 0	4 8 0	...	...	
Sâl and Sain, Karis 12′ × 5″ × 4″ ...	16 0 0	45 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	8 0 0	10 0 0	..	...	
Bamboos of 9′ to 10′ per 100 score ..	...	...	25 0 0	50 0 0	
MORADABAD.					
Sâl 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sâl and Sain, &c., Karis 12′ × 5″ × 4″ Sal ...	50 0 0	60 0 0			
Sain	30 0 0	40 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″	8 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
BULANDSHAHR.					
Sâl 10′ Tors (Poles) ...	10 0 0	14 0 0	..	...	
Sâl and Sain, etc., Karis 12′ × 5″ × 4″ Sain	30 0 0	35 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	7 8 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	60 0 0	
PILIBHIT.					
Sâl, 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sâl and Sain, &c., Kuries 12′ × 5″ × 4″ ...	30 0 0	40 0 0	..	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	40 0 0	100 0 0 500 0 0	
DELHI.					
Sâl, 10′ Tors (Poles) ...	7 0 0	10 0 0	..	...	
Sâl and Sain, &c., Karis, 12′ × 5″ × 4″ Sal ...	50 0 0	60 0 0	..	...	
Sain...	25 0 0	30 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	9 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	25 0 0	75 0 0	
BAREILLY.					
Sâl 10′ Tors (Poles) ...	5 0 0	10 0 0	...	..	
Sâl and Sain, &c., Karis, 12′ × 5 × 4″	25 0 0 40 0 0	35 0 0 50 0 0 60 0 0	... ...	... .	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	..	...	50 0 0	137 0 0	

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The Forests and Fauna of British Central Africa. (Part II).

In May and June I went through a serious illness and was advised to leave the country, but I had no notion of abandoning a trip that had cost me so much trouble and expense, so I determined to get up to the top of Milanji mountain and there recruit my health. I only had my twelve Manganja boys, and found it impossible to get a set of bearers to carry me up in a machilla, so had to trudge the journey on foot, a distance of some 80 miles. Accordingly, I made a start at the latter end of June. The path led along the banks of the Ruo River; after leaving Chiromo we passed through an extensive grove of *Hyphæne* palms, then through numerous patches of Manganja cultivation. The water in the Ruo was beautifully clear and shoals of large fish were distinctly visible in every pool. The mealie gardens on the banks of the stream had been considerably ravaged by Hippopotami. The forests on the Portugese side of Ruo, were considerably finer than any I had seen yet, consisting as they did principally of the "masetu" already mentioned. I had managed to walk fourteen miles by sunset and having outstripped my boys, waited under a big tree for them to come up. The guinea fowl were flying down to roost on the large trees on the river's bank, so I sent one of my Indian boys back and got my shot gun, and killed a couple for the pot.

The men were so heavily laden, that it was 8 P. M. before the last of them straggled in. The spot where we had camped had been a large village of Malolo's, but had been recently burnt down, and Malolo expelled. He was camped on the opposite side of the Ruo. At daybreak we resumed our march through more abandoned villages, and after travelling about four miles, began ascending the hills. Hitherto the path had followed the bed of the Ruo, which, for the last ten miles, had become rocky and broken. After climbing up about 1,500 feet we entered a broken and hilly country precisely similar to some parts of the Wynaad. Very few

of the trees exceeded 18 inches in diameter, the ground underneath being covered with a dense growth of grass, from four to ten feet high, the bark Cloth trees here (an Acacia-like tree with the usual pinnated leaves resembling *Albizzia Lebbek*) were the principal feature in the landscape. I searched for seed but could find none as the pods were still green.

For some six miles the path led up and down steep hills, till we finally emerged on a clearing. This was a coffee estate belonging to Mr. Buchanan. We walked through the estate and sat down under a tree to wait for the baggage to come up. It was then about 2 P. M., so I amused myself walking through the coffee, and examining the growth of the trees. Such of them as were alive looked healthy enough and were fairly well grown, but there was an immense proportion of gaps, and a still greater number of trees, either dead or dying. A careful examination showed that two species of Longicorn beetle had been at work on them. One species had girdled the trees, and thus killed them. The larvæ of the other had attacked the roots in numbers, boring tunnels to the very end of each of the main roots. I obtained specimens of both beetles and found the first species exactly similar to the one that girdles coffee trees in India. As a rule, this beetle only lays one egg, and the larva bores either up or down the pith of the stems. The second mentioned species, which is less than half the size of the other, appears to lay numerous eggs.

The men turned up about 3 P. M. and absolutely refused to travel any further, so we camped for the night on the banks of the river. A Yao came to my camp in the evening, and offered to show me a Hippo pool, if I would give him the modest sum of Rs. 10. It rained during the night, and my boys had a miserable time of it, for though I had warned them that rain was coming and advised them to put up a grass hut for themselves they were too lazy to do so, and suffered the consequences. At daybreak, an immense flock of guinea fowl came down to the rocks on the opposite bank of the river, and began preening their feathers, but the river was deep, and there was no way of crossing, for the crocodiles were floating about everywhere. Whilst watching the guinea fowl, there was a great commotion amongst them, and loud screeching and cackling, as they flew up into the trees; and presently a large panther appeared sneaking amongst the rocks. I tried to get a shot at him with my Lee-Metford, but did not get a fair chance.

We started about 7-30, for my tent was wet, and I had to light a fire in it and dry it. After travelling over a much more level country for about 12 miles, we met another Yao villager who promised to show us any number of Hippo in a pool in the river about a mile from the road, and implored us to shoot them as they were doing much damage to the cultivation. As I felt week and exhausted, I went to the pool and camped under a large

tree. There were many old signs of Hippo about, but not one did we see and this was accounted for next morning by some villagers who came over from the opposite village in a bark canoe and told us that some "Mazungoos" (white men) had come from a coffee estate a few days previously, and had fired at, and driven the Hippos away.

I amused myself fishing in the evening and caught some carp, very similar to the *Barbus carnaticus* of India, but with a golden tinge on the sides. There were some fine perch of some two or three lbs in weight, but I only succeeded in getting one of these gentry, with a mole cricket as a bait.

The next morning after travelling about half a mile I came to Mr. Simpson's Inchila estate where he very kindly asked me to stay. I was much disgusted with my boys for not letting me know about this, for I would have had a more comfortable time of it in the hut; the Inchila river had to be crossed by wading, after this, and very cold I found the water. A good bridle road from this point made travelling very much easier. We passed through country that had been heavily 'Koomried.' In many places the forest had not been able to re-assert itself, and large patches were entirely covered with high grass. The country was slightly undulating, with small streams in the hollows. Numerous patches of 'Masuko' trees were seen. This tree yields one of the best edible wild fruits of Central Africa. Owing to the trees having been 'Koomried' they consisted chiefly of straight poles, the leaves somewhat resembling those of the Semecarpus or * Marking-nut tree; the fruit is about the size of a loquat with a leathery pinkish brown skin. I did not succeed in securing any of the seed, but got some young plants. I found some custard apples growing in old 'Koomrie' land, my boys called it the 'Imposa' and declared the fruit to be excellent eating; I secured some plants. The profusion of wild flowers was delightful, and I obtained the seeds and plants of many species. There were no less than three species of cowhage, † one bearing beautiful bunches of creamy white flowers, the other two species were somewhat similar to the common Indian ones. I found the hairy pods the greatest curse in travelling subsequently, and was driven out of one or two camps by the fine hairs being blown by the wind into my tent.

That night we camped once more on the banks of the Ruo, and the next day, after a longish march, reached Mr. Simpson's Tundialema estate, at an elevation of about 3,000 feet, on the slopes of the Milanji range. The last 1,000 feet was a sheer pull up the mountain side and took it most completely out of us. Here I put up in a small brick-built house, belonging to Mr. Simpson, who very kindly placed it at my disposal.

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* Semecarpus Anacardium; † Mucuna pruriens.

Unfortunately for me that gentleman was absent in Chiromo. After a couple of days' rest, I decided in getting up to the top of the mountain, but my boys had other ideas on the subject; labour was very scarce, and the few men Mr. Simpson had were urgently wanted for estate work. However, as my boys were bound to serve me by stamped agreement, I insisted upon their going up, promising, however, not to keep them there, but to send them back directly.

Upon this, they made a clean bolt of it, so I sent one of Mr. Simpson's men after them, to tell them that I was writing to the Collector at Chiromo, who would severely punish them for breach of engagement; this brought them to their senses, and we succeeded in making a start finally.

A few hundred yards from Mr. Simpson's house, we entered a veritable shola, with lofty trees, and magnificent bamboos. Balsams and orchids grew on every rock and cranny, and a beautiful clear stream of water, icy cold, tumbled over moss-grown rocks. After passing through the shola we emerged on sheet rock, and after that, the climbing became extremely difficult for me in my then weak state. As we mounted higher and higher, I found many strange and new wild flowers, beautiful aloes, with salmon coloured and red flowers, growing out of the crannies of the rocks. A small proteaceous tree was remarkable for its large white flowers, it might have been mistaken, in the distance, for a Rhododendron, and reminded me of the 'Warratah' flowers of Australia, which I saw growing on the hills near Sydney. Wild heaths, ten and fifteen feet in height, were abundant, but the flowers were small and inconspicuous.

About 4 P. M. I struggled to the top, and rested on a slab of rock, admiring the fine prospect spread beneath my feet, the view was very similar to what may be seen at Pykara or Naduvatam, where one gazes over the interminable forests of Wynaad and Mysore. Nothing disturbed the silence and solitude of the spot but the harsh croaking of four or five pied African ravens that inquisitively peered at me from the crags around. After an hour or so my boys came panting up the hill with my leather cowrie boxes, and a half mile walk over a grassy down led us to Mr. Simpson's hut built on the banks of a small stream.

A bitterly keen southerly wind had commenced to blow, so my boys lost no time in hurrying down the hill again, leaving me and my two Indian servants to shift as best we could; we had also two Mangaoja boys, whom I provided with warm woollen clothing. The night was bitterly cold, and I got no sleep, the keen wind came in through the cracks and crannies of the wattle and daub walls. I had lit a fire on the floor of the room, but the smoke very soon drove me out of the improvised bamboo cot which Simpson had put up, so I had to spend the night cowering over the fire. The four succeeding

nights were spent in much the same manner. At early dawn I made myself a cup of cocoa and started off with my Lee-Metford to climb the high hill behind the camp. The whole country was covered with hoar frost in the valleys, and when this melted, and my boots got wet it was decidedly unpleasant. From the top of the hill I looked over a great valley lying at my feet, down which a stream flowed, the head waters of the Ruo. Looking south-eastwards there was a great gorge covered with heavy shola. At the head of the stream, another valley branched up the centre of the range, and its lower portion was clothed with that magnificent tree, the Milanji cedar. There was a considerable wood too to my left and a smaller still further north, full of these cedar trees, while numerous small sholas exactly like those on the Koondah mountains were scattered about in the minor valleys and slopes.

Of animal life there seemed to be but little, with the exception of wild pigs, which had made numerous narrow pathways in every direction. After breakfast I took a small 28 bore gun and the Lee-Metford, and went on a botanizing expedition into the sholas. Birds were very scarce, but I managed to shoot a beautiful Turaco, or plantain-eater, a lovely grass-green bird, shape somewhat like a magpie, with lake-coloured patches on the wings. These birds were exceedingly noisy, and anything but musical, for they made the woods resound again with their harsh notes. No sooner had a small party of these birds uttered their discordant cries, than every Turaco within hearing joined in the chorus. I here obtained a beautiful sun bird, sage green above, with a canary-coloured breast and a beautiful scarlet band round the throat, the top of the head being capped with metallic green. We also flushed a ground dove in a small wood, which after considerable trouble I succeeded in bagging. It was of a beautiful bluish slate colour, paling into ash about the neck, doubtless a *Chalcophaps*. Some large bluish-coloured wood pigeons were also seen flying from wood to wood, but they never gave me the chance of a shot. We came upon traces of a large cane rat, and heard it calling, also saw in two places amongst the rocks about a bushel of hares' buttons but never saw the animals themselves. I picked up the jaw bone of what appeared to be a rodent from the molars, but the extraordinary thing was, that the sockets of two well developed canines, which had fallen out, appeared in the jaw. I secured an extraordinary rodent covered with the most beautifully soft and silky fur, with minute eyes no bigger than a pin's head, this animal had only the vestige of a tail, about ¼ of an inch long. This strange creature I kept for three or four days, when it made its escape. My boys called it "Nyamtuka." The first discovery I made was a fine species of bamboo growing at an elevation of about 8,000 feet inside the sholas. I succeeded in obtaining four off-shoots. This fine Bamboo grows to a

height of 50 or 60 feet, with a diameter of 3½ inches. It is thornless, and struck me as being the very thing I had so long wanted to introduce on the Nilgiris, namely, a useful species of large Bamboo.

The next day I devoted entirely to the collection of seeds and bulbs and other botanical treasures, getting many specimens of new Gladioli, ground orchids, aloes, orchids, etc. I managed to bribe some of my boys to climb some Widdringtonias,* and spent three days thus collecting seed, but found it very unsatisfactory work, the cones being scarce, scattered far apart in the branches, and mostly immature. However, I got a few ounces of clear seed in all.

I had sent my boys away to Lake Ghirwa, some 60 miles distant, to obtain fowls and eggs, as none were procurable nearer; they fortunately turned up on the fifth day. That evening, I felt great pain in my knees, and foreseeing that I was in for one of my usual bad attacks of rheumatism, I returned the next morning to Mr. Simpson's estate. There I was laid up for the greater part of the month with a severe attack of rheumatism. As soon as I was well enough to be carried in a machilla, I started for Zomba, as the Commissioner had kindly invited me to go there, but owing to the cold which made my rheumatism worse, I was compelled to return six days afterwards to Mr. Simpson's estate, without ever having got to Zomba. Mr. Simpson having returned, kindly provided me with some Atonga carriers, and both my servant and myself were carried down to Chiromo, the legs of the former having so swelled that he was unable to walk. I met with no adventures on the road, with the exception of shooting a big bull Hippo at the "Tuchila estate," which came in as a godsend for my men and the villagers.

The Tuchila plain, though a magnificent game country in former times, is now almost destitute of game, and during the time that I was in the Milanji district, both my men and myself had to undergo a considerable course of starvation; the only thing I shot was one guinea fowl during the month I was there; eggs and chickens were almost impossible to obtain, the people were poverty-stricken, and had nothing to barter with us except sweet potatoes.

After remaining some time at Chiromo to recruit my health, I started westwards to explore the country between the Shiré and Zambesi rivers, as my boys gave me a glowing description of it and the amount of game there. We accordingly started one morning in a southerly direction, and camped near a village some four miles from the foot of the hills. The next day our path lay amongst numerous stony hills covered with ebony and acacia trees, but stunted in growth. About mid-day we crossed the hills and descended into Portugese territory, the boundary line running along the water-shed at an elevation of about 1,500 feet

* W. Whytei.

above the sea. About 3 P. M. we reached a small village where we camped. The appearance of the country was not attractive so far as prospects of game were concerned. There was no water except a small stagnant pool near the village, and no signs of game about whatsoever. I travelled altogether eight days in this country without firing a shot, and without seeing any game except one small herd of Zebra. The population seemed to be considerable. I passed numerous villages the owners of which paid tax to nobody. Some of the women and children had never seen a white man before. As the grass was being burnt everywhere and the country very rocky and stony, I determined to push farther north where the hills rose to a considerably higher elevation, and running water might be expected. We finally got into this country and I had some good sport. The character of the forest was pretty much the same everywhere, the trees were from thirty or forty feet in height on the slopes of the hills, and at that time of the year, were quite leafless. The young grass was beginning to spring up wherever it had been burnt, and game, though fairly abundant, was extremely difficult to approach, owing to the open nature of the forests and the smallness of the trees, and there being no undergrowth of any description whatever. I only came across two "Masetus," they were of considerable extent, and very difficult to penetrate. I entered one and after following Rhino pathways for some time, finally got lost in it, and it took me six hours' very hard work to get out again. Baobabs and acacias were the prevailing trees, but there were numerous Euphorbias with very umbrageous heads, scattered about everywhere, and the edges of the Masetus were thickly covered with wild coffee in full blossom.

I found this coffee very abundant on the banks of the 'Ruo' in May ; and collected some of the seed which I sent to India. The seed of this species of coffee is reddish yellow, extremely small and perfectly worthless as an article of commerce.

I found the wild coffee of the Mozambique province cultivated by the natives of the coast. The berry, though small in size, is very like pea-berry coffee. The fruit is purple, and the crop abundant. This coffee is mostly consumed by the Portugese on the coast. I collected some seed and sent it to India, but for some reason it failed to germinate.

A striking feature of the flat country on both sides of this range of hills is the 'Mopani' tree, it is gregarious, and grows in patches of from 50 to 200 acres. As a rule only very short grass grows under these trees, in some places none at all. Its habit of growth is very like that of *Terminalia tomentosa* and it has the same ragged and cracked bark ; but the leaves are like those of a *Bauhinia*, with this difference, that the leaflets have not the rounded edges of the typical *Bauhinia* leaf but are sharply acuminate. The wood is very hard, of a dark reddish claret colour, and is apparently

durable; but the Manganje could tell me nothing of its qualities as they only use small poles in the construction of their huts and seem utterly ignorant of the quality or value of the many fine hard woods that I found growing in these forests. The axes they use are so wretchedly small and weak, that they are utterly unable to fell the large trees in their Koomrie clearings, but manage very cleverly and burn them down with fire. They know thoroughly the uses of particular kinds of woods which are used by them for trivial purposes, *e. g.* for making bows, spear handles, musical instruments, walking sticks, etc. A peculiar feature of these forests are the large 'Dambos' or open plains which occur both on their edges and interior. These "Dambos" in the rains are flooded with water and swampy, they are overgrown with various descriptions of grass, but as a rule, are destitute of trees, though some of them are partially covered with swamp *Acacia* which somewhat resembles the Babul* but has a more umbrageous head, and rarely exceeds 18 feet in height. The variety of *Acacias* in Africa is something astounding and they undoubtedly constitute the bulk of the trees in the plains forests.

I returned to Chiromo at the end of September and immediately started for a trip across the Ruo in an easterly direction. After crossing the Ruo about fifty square miles of country along its banks and those of the Shiré, in a triangle, consists entirely of "Masetus." Some of these are a mile apart, some only thirty or forty yards, they all run more or less parallel to one another, but there are connecting glades between them. There are some trees scattered about in these glades, which are the favourite resort of game of all descriptions, including that grand animal, the Sable Antelope. Here I found growing, a gouty looking leafless, Euphorbiaceous shrub covered with the most beautiful pink flowers. All my attempts to strike cuttings failed. Here I had some very good sport. Fish in the Ruo were numerous, and three or four species proved excellent eating. A carp weighing about 8 or 10 lbs. of a beautiful silvery colour with five or six narrow, purplish, metallic stripes on each side, and orange fins and tail, rose readily at a spoon bait, besides taking a minnow: but I had to use gimp on account of their jaws being armed with the most fearfully serrated shark-like teeth. A handsome dark coloured perch was abundant, and easily caught with a locust as a bait. Another species of carp known as "Pendé," with an exceedingly small mouth and minute scales, could only be taken with paste, or raw meat, as a bait. The large carp, known as 'Mafuta,' which I caught in the 'Tuchila' was abundant here, and besides these there was an ugly Barbel-like fish, with a film over its eyes, known as "Nenje," occasionally caught in nets, as also the "Nyumé," a siluroid that the natives were very fond of

* Acacia arabica.

smoking. During the rains the "Kassao" or Sawfish sometimes comes up the river and is speared by the natives. It grows to an enormous size.

The flies were exceedingly troublesome, and so were the locusts, tremendous flights of which passed over the camp, and were a source of great annoyance. We had to light fires under the camp trees to prevent them eating all the leaves off, and thus depriving us of our only shade, the young grass which had sprung up to a height of six or seven inches was eaten down to the roots, and such trees as had put forth their spring foliage were stripped bare. It was impossible to walk anywhere when they were about, for they fly up in clouds and hit you in the face so frequently as to make the nuisance perfectly intolerable. Of course all the game cleared out.

As I had arranged to be back in India, and had taken a return ticket for a year, I was obliged regretfully to give up all further ideas of exploration and sport, just at the very time that the latter would be at its best.

I returned to Chiromo on the 6th of November, sold off all my goods and chattels by auction at a considerable sacrifice, packed up my other belongings, and was ready to start by the 9th. I had missed by two days the opportunity of going down by one of Sharrer's house-boats, so had to content myself with a barge as far as Port Herald.

Our way down the river was extremely tedious and slow, for the water was only a few inches deep on the banks, and we were detained more than half way down by a solitary bull Hippo who disputed the passage, until I put an express bullet into his skull. We reached Port Herald on the 12th. To my surprise I found the house-boat still there, with a shooting party on board.

This party originally consisted of Mr. G. M. Morgan, Major Trollope of the Guards and Dr White. Major Trollope had however left them to go up to Lake Nyassa; they had had no sport and encountered many hardships. We had to wait three more days at Port Herald where I stayed with Mr. Galt, the Assistant Collector. At last the long looked for steamer came-up, and we got down to Pinda Marsh after sticking a dozen times in the sand-banks, where the vessel had to be dug out, and towed into deep water by the villagers. In one place, where we stuck badly, Mr. Irwin (Sharrer's manager) and myself had to swim across part of the river to fix the anchor on the bank. After completing this little performance, I found a crocodile contemplating me with a view to dinner from behind a clump of reeds, so I declined to cross the river again and waited for the steamer to be brought to me, which took place about an hour later. At Pinda, we transhipped into another steamer and managed to get down as far as Shupanga without grounding more than two or three times. Here Mr. Morgan, who had suffered the previous night from an

attack of fever, became much worse, and by 3 P. M. died in spite of all the Doctor could do for him, such is the rapidity with which these African fevers often terminate a man's life!

We stopped the steamer, and buried him about a mile distant, under a clump of Palmyra palms.

We finally reached Chindé, 12 days after leaving Chiromo. I had to wait there till the German steamer the "Carl Peters" arrived. In this I had to go south to Delagoa Bay, where I transhipped into the "Kanzler." We touched at Beira and I landed and had a walk about the town.

This place is a small sandspit, entirely surrounded by mangrove swamps and must be very unhealthy. The houses are all built of galvanised iron, and boast of no architectural beauty. The approach to the Bay is decidedly picturesque, there being many forest-covered islands scattered about. We sailed the next day for Mozambique, and once more I had to undergo the miseries of an attack of acute rheumatism in a confined cabin. We reached Zanzibar on the 16th December when I discovered to my disgust that the steamer "Safari," which was to have carried me to Bombay had been ordered by the Directors on a special coasting trip southwards. With much trouble and difficulty I had myself conveyed on shore to the Hotel D'Angleterre where I spent a most miserable fortnight in bed. When I could get about a bit, I went for the few remaining days for short strolls into the country and to the Zanzibar Club, which is a very good one.

The island of Zanzibar is extremely fertile, and the scenery park-like. Thousands of noble mango and other trees are scattered about at intervals, with a pretty green sward underneath. Cocoanuts are also grown, but not to such an extent as to mar the scenery; there are extensive clove plantations and I also found the jack, tamarind, and Malayan durian, naturalised. I bought some durian fruit * for 12 annas each, for the sake of the seed, but I cannot say that the atrocious smell and flavour of this fruit commended it either to my nose or palate. The Custom House was interesting from its piles of ivory, and bags of cloves which rather overwhelmed the neighbourhood with their strong odour. The Sultan has a garden with numerous date-palms in it, all of which were fruiting freely. I noticed some vines too in the town that were fruiting well. The market seemed supplied with mangoes, pineapples, and plantains, in abundance. I saw some fine cattle imported from Somaliland for slaughter. Sheep are scarce and all of the Fat-tailed or "Domba" variety. Camels are also slaughtered and eaten, but the specimens that I saw were the most awfully miserable beasts conceivable. The native town and beach is unspeakably filthy, and it is marvellous that the inhabitants are not decimated by disease. The Sultan has conferred a benefit on the

* Durio Zibethicus.

town by supplying it with fairly good water. He resides in a lofty and well-built palace, facing the sea; this edifice is lighted at night by electric lamps, there is a clock tower in front of it, which keeps Arabic time, *i. e.*, the hours of the day are counted from 6 A. M. to to 6 P. M. the former being 1 o'clock and the latter 12.

On the 2nd of January I sailed in the "Safari" reaching Tanga on the 4th. I landed and went ashore with a German planter of the name of Illish, who introduced me to a French naturalist, who had made a splendid collection of birds and small mammals; amongst the latter, the most noticeable was a rodent the size of a hare with no less that 22 pairs of ribs! I had to be on board again in half an hour, so my visit was a hurried one. The town is beautifully laid out and the Railway well constructed, the place is decidedly picturesque, the "Usagara" hills in the back ground being visible along this line of coast.

After an uneventful voyage of 11 days, during which we had fair weather, I said good-bye to Captain Ganhé from whom I had received the greatest kindness and consideration on both voyages.

The "Safari" is a beautifully clean steamer, and the food excellent, so I was almost sorry the voyage was over. I left in the "Nawab" on the 18th with Captain Sandilands, and reached Calicut on the 21st; thus ended my trip to Africa. It had thus taken me nearly two and a half months to get from Central Africa to India!

On overhauling the collections I had made in Africa, I discovered many seeds and bulbs were missing, though these had all been carefully packed for transport. I also found, to my intense disgust, that the jawbones of sixteen head of eland, koodoo, etc., which I had intended setting up as trophies were *non est.* Both my servants had gone to their country to see their families, and they both took very good care not to come back again. These men did nothing but quarrel with one another whilst in Africa, the cook was always threatening my other servant that he would be revenged upon him. All my collections had been labelled, numbered and placed under lock and key, and my servant made responsible for them, but there can be little doubt that the cook made away with them to get his fellow servant into trouble. As for the living plants brought over, notwithstanding the utmost care and trouble, I lost some of the most valuable plants from white-ants at Chiromo, my whole collection of orchids was dropped by the Manganja boy Vicenti into the Zambesi River, he tied a rope to their crate, and plunged it in the river to wet the orchids, the rope broke, and I was not told anything about it till next day!

The lascars on board the various steamers except the "Nawab" and "Safari" did their utmost to destory the balance of the plants, by wetting them with salt water from the hose, and did actually kill the greater part of them in that way.

R. M.

Lebdieropsis orbicularis in Hyderabad.

This tree (Koorsi-Kodarsi-Nalla Kodarsi, Telugu) is one of the most generally used and important trees in His Highness' Dominions. Although growing to no great size, it is plentifully distributed almost everywhere, except in the Aurangabad Zillah, and is greatly valued in its pole stage. The most favourite poles are those from 18 to 22 inches in girth. They are dressed and split from end to end in the forests and sold in the neighbouring villages and towns at about 6 to 8 annas each. These poles are very durable and quite as popular as Teak. This species has been lately included in the Reserved list of trees, but formerly it was free to all agriculturists and most other inhabitants. The result was that it (in common with many other valuable species) was exploited in lacs. Fortunately, there is hardly any species the reproduction of which is so satisfactory. It coppices splendidly in spite of the fiercest fires, and cattle do not eat the leaves, so it escapes the axe of the herdsman. The wood does not appear to be eaten by white-ants and the young shoots and branches are much used for dunnage for roofs of houses.

It is well known, I believe, that the hard rind of the capsules is poisonous, but I notice that neither Brandis nor Gamble allude to the fact that the bark must also contain some poisonous property, for not only do white-ants leave it severely alone but it is used here for poisoning fish, though said to be scarcely so effective as "Barringtonia" bark. I am told that the inner bark, when placed on the sores of sheep and goats, is efficacious in healing them and in destroying maggots.

W. F. Bisco.

Influence of Forests on Hail.

M. Claudot, one of the officers attached to the "Station de Récherches" at Nancy, devotes an article to the above subject in one of the March numbers of the "Révue des Eaux et Forêts," and it would appear that experience shews very clearly that a hail-storm which is severe before reaching a wooded area immediately weakens in force over the forest, where moreover, it seems seldom to do much damage, and causes but very slight, if any, harm to the crops on the further side, dying away very rapidly. The money figures shewing the destruction caused in the crops where the hail is severe looks appalling, and if further observation bears out the view above mentioned we may really come gradually (very gradually) to having the country parcelled off into areas of forest intersecting areas of cultivation; for the rather hazy observations at present available on the meteorological effects of forest, not merely in the matter of hail, but also of rain, wind, &c. &c., seem at least to point to the happiest arrangement being one in which cultivation alternates with forest. In the future, when

the socialists have put us all right and set up a form of government which will do everything for everybody, we may perhaps expect sweeping and very "zabardast" (for such a government will be extremely "zabardast") laws ordering that so much per cent. of each parish, orcountry, shall be under wood. It does not appear sufficient, however, to have mere screens, the wood must be in fairly large masses to affect the hail. As yet, of course, the observations made are insufficient. It is not known, for example, to what extent the orography of a country affects hailstorms.

M. Claudot quotes Becquerel, a "savant" who studied this subject in the sixties. The latter brought forward two theories. the first was that the forest stopped the masses of air, which caused these to collect and to flow along the borders; the speed being thus slackened a fall of hail took place in front of the forest. This, it seems to us, might mean that a forest area was actually harmful. It was, however, answered by another "Savant," who pointed out that the height of a forest was scarcely likely to have much effect when it was recollected that storms were probably formed at some 2,000 metres above the earth. M. Becquerel's second theory was that if we accepted Volta's notion that electricity had something to do with the formation of hail, the trees might act as lightning conductors and thus extract the electricity from the clouds.

Why should there not be a "Bureau de Recherches" established to consider these and all other matters of a like nature? Perhaps the meteorological observations could be best undertaken by the Meteorological Department, but besides the meteorology of forests there are a thousand and one matters calling for careful study by Foresters, and inasmuch as the great difficulty is to collect, and place on record in a form which can be got at by all, the observations that are made in a desultory way here and there by Forest officers and others, we think there should be a special officer for this business and he should traved from Province to Province and write reports, which might be published *in extenso* in the "Indian Forester."

"Q."

Forest Officers as Photographers.

We are asked to draw the attention of our readers to an article in the 'Révue des Eaux et Fôrets' for February 1895 entitled 'Le Forestier Photographe.' The writer explains the importance of photography as an aid to reports shewing the progress of works of reproduction or 'reboisement'; he points out what an advantage it would be in cases of storm, frost, fire and other disasters to have the reports supplemented by photography; he shows how useful it might be in the case of works of construction to shew what they are like; and especially he recommends periodical pictures taken with a camera printing vertically upwards to shew the gradual closing up of the canopy of a forest.

He goes on to point out what a source of interest and amusement photography can be to the lonely 'Garde Général' in a country village with no society, and advises all such to take to the art as a means of relieving the monotony of such an existence.

In India, also, there are many subjects for the 'forestier photographe' and there are many Forest officers who are passed masters in the art as we know well from the specimens we have seen of their productions. We may, however, remind our readers that there is a large Government camera kept at the Forest School for forest use in any Province under rules made by the Inspector General, which we think may have been somewhat forgotten.

II.—CORRESPONDENCE.

Beetle attacking Satinwood.

SIR,

I beg to send herewith a larva with the following information :—

I found this larva in a hole in a dead satin tree 3½ ft. girth, standing in the Forest of Kambalpally Manukota Taluk. It has bored the tree right through the heart-wood, and the dust of the wood it had bored was collected at the bottom of the tree. It is doubtful, however, whether the tree died owing to the damage done by these larvæ.

In one place I saw a living tree attacked by this species. I think this larva belongs to the family *Lucanidæ*, but should be glad if you could kindly identify it.

CAMP KAMBALPALLY,
Dated 16th April, 1896.

GOPAL KRISHNA RAO,
Sub-Assistant Conservator,
H. H. N. D

We have asked our correspondent to send the perfect insect, as beetles cannot be named from larvæ only. The larva looks like that of a Longicorn.

HON. ED.

The Common Bamboo of the Rajpipla State.

SIR,

The thorny Bamboo (*Bambusa arundiuacea*) is flowering spasmodically, and the thousands of clumps forming the beautiful Bamboo forests of the State are now about to disappear ; it is hoped, however, that a vigorous natural regeneration will soon take place.

There is no record of the previous flowering of this Bamboo, the aboriginal Bheel population give one but a very unsatisfactory and vague explanation.

J. A. W.

A Departmental Blazer.

I am glad to see Velleda referring to the subject of colours for the Indian Forest Service. I think his suggestion of Local Committees to consider the subject is good. Each Province might make its suggestion in the pages of the "Forester," the proposals might then be put to the vote, and the choice of the majority adopted. The Honorary Editor would, I am sure, be kind enough to receive the votes.

I think it is essential that there should be one blazer, with tie and ribbon to match, for the whole of the Indian Service throughout India. Each Provincial Service would be at liberty to adopt its own colours, provided they be not those of the Indian Forest Service.

Some time ago I went into the subject, and got patterns from various firms. The colours I finally thought to be most suitable were dark green and crimson, in broad alternate stripes, with a narrow stripe of pale blue between them. Without the blue the other colours look dingy. I tried various others, white, yellow, pink, &c., but nothing brightens up the crimson and green like pale blue.

The Bengal Pilot Service colours are crimson and dark blue with narrow pale blue. The substitution of dark green for the dark blue makes the pattern I propose quite distinct, and the combination is very effective. The green and crimson to be of the shades of the leaves and flowers of the common Himalayan Rhododendron. No other service has these colours. A Line regiment (I forget which) has an appallingly hideous brickdust red and grasshopper green with narrow white line, which no one could mistake for the colours I suggest.

A proposal has, I believe, been made to have a dark blue blazer with the Monogram I. F. S. in white on the pocket, but this is too near the old Coopers Hill Blazer, which, I believe, has been recently altered.

The considerations then are :—

I. The colours to be for the whole Indian Forest Service, and for the members of that service only.

II. The colours must be distinctive, at least not ugly, and as permanent as possible.

C. F. E.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Admission of Non-Covenanted Forest Officers to the European Services Leave Rules.

We have received Circular 5 F. of April 30th, of the Government of India on this subject and reproduce the following despatches.

No. 366, dated Calcutta, the 25th December 1895.

From—The Government of India, Finance and Commerce Department,

To—Her Majesty's Secretary of State for India.

We have the honour to forward, for Your Lordship's information, a copy of correspondence with the Accountant General, Madras, from which it will be seen that we have admitted Mr. E. R. Murray, Deputy Conservator of Forests, Madras, to the European Services Leave Rules contained in Chapter XIII of the Civil Service Regulations. Mr. Murray, who was originally appointed in India to a post in the Lower Controlling Staff of the Forest Service, was in February 1885 promoted unconditionally to an appointment in the Upper Controlling Staff, and is therefore now a member of the Imperial Branch of the Indian Forest Service.

2. There are a number of other officers of the Forest Department the circumstances of whose appointment are similar to those in the case of Mr. Murray. We are admitting them to the European Services Leave Rules on the ground that the orders in paragraph 6 of the Earl of Kimberley's Financial Despatch No. 188, dated 21st September 1893, cover the case of officers of the Forest Department who have in the past been recruited in India and were either originally appointed to a post which, under the orders contained in paragraph 20 of our Circular in the Revenue and Agricultural Department, No. 18 F., dated 29th July 1891, is now included in the Imperial Branch of the Forest Service, or have been promoted to such a post from the lower branch of the service. We trust that our action will meet with Your Lordship's approval.

No. 28, (Financial) dated London, the 13th February 1896.

From—Her Majesty's Secretary of State for India,

To—The Government of India.

I have considered in Council your letter dated the 25th of December last, No. 366, and approve of the action of your Government in regard to the admission to the European Services Leave Rules of Mr. E. R. Murray, a Deputy Conservator of Forests in Madras, and of other officers of the Forest Department

who have in the past been recruited in India, and were either originally appointed to a post which is now included in the Imperial Branch of the Forest Service, or have been promoted to such a post from the lower branch of the service.

Budget Estimates of Revenue and Expenditure for 1896-97.

	REVENUE.	EXPENDITURE.
	BUDGET ESTIMATE, 1896-97.	BUDGET ESTIMATE, 1896-97.
	Total.	Total.
	Rs.	Rs.
India, General :—		
Andamans	3,16,000	2,16,000
Baluchistan	15,000	42,000
Ajmere	14,000	16,000
Coorg	1,54,000	81,000
Forest School	3,000	66,000
,, Survey	..	32,000
Indore	3,000	3,000
General Direction	...	83,000
TOTAL INDIA, GENERAL ...	5,05,000	5,39,000
Central Provinces	11,50,000	10,50,000
Upper Burma	23,50,000	7,50,000
Lower ,, ...	33,05,000	15,54,000
Assam	5,00,000	3,10,000
Bengal	12,70,000	7,70,000
North-Western Provinces and Oudh ...	16.80,000	9,30,000
Punjab	10,00,000	7,75,000
Madras	20,16,000	16,70 000
Bombay	35,47,000	20,13,000
TOTAL INDIA ...	1,73,23,000	1,03,61,000
England	...	56,000
Exchange	...	41,000
GRAND TOTAL ...	1,73,23,000	1,04,58,000
SURPLUS ...	68,65,000	...

Discussion in Working Plans of the Method of treatment proposed.

We have received from the Inspector General of Forests his Circular No. 6 W. P. of May 11th, 1896 on this subject.

In regard to certain working-plan reports, submitted for my opinion under section 88 of the Forest Department Code, I

observed that the method of sylvicultural treatment proposed had been inadequately discussed and justified, and I have accordingly the honor to address you on the subject.

2. Section 87 of the Code is in this respect perhaps insufficiently clear. It rules that, in working-plan reports under "method of treatment," the following subjects shall as far as possible be discussed :—

(*a*) Object sought to be obtained.
(*b*) Method of treatment adopted.
(*c*) The exploitable age.

3. It is obvious that for every forest there is only one method of treatment which is sylviculturally the best, and which ought to be adopted if circumstances so permit. But circumstances do not always permit, and in the case of our Indian forests they rarely permit, the unqualified application of the theoretically correct plan. Thus we may frequently be obliged to adopt, during a period of known duration, a preliminary course of treatment preparatory to the application of the sylviculturally correct method. Or we may be forced to have recourse to a method which is not the best but which we are constrained to apply during an indeterminate period in order to satisfy conditions, such as the want of demand now existing and expected to obtain more or less indefinitely.

4. I need not enlarge upon the disadvantage of dealing in working-plans report *only* with the method which it is proposed to immediately apply but which may not necessarily be the best from a purely sylvicultural point of view. In the first place, it would in that case be almost impossible for anybody not personally acquainted with the local circumstances to understand why a method of treatment, which *primâ facie* is sylviculturally superior, *i.e.*, better suited to the physical conditions of the forest, had not been adopted. Moreover, circumstances such as the demand for produce and the like may, and in many places will almost certainly, improve, and thus admit of better sylviculture.

5. I have therefore the honour to request, with reference to sections 84 and 87 of the Forest Department Code, that where the treatment deemed theoretically correct cannot at present be applied, it may none the less be briefly discussed and clearly indicated in the plan. Any unavoidable departure from that method should then as far as possible be explained and justified in detail. Lastly, the plan should review the probable results of the treatment it is proposed to apply, and should explain how and to what extent the improvement of the crop is provided for. In treatment of the best possible sylvicultural method the three subjects mentioned in paragraph 2 above may suitably be taken together but consecutively. In other respects, and provided the spirit of the foregoing instructions is observed, the arrangement prescribed by the Code may conveniently be followed.

Resolutions of the Forest School Board of Control of 1896.

Resolutions passed by the Board of Control for the Imperial Forest School, Dehra Dun, at sittings held on the 21st, 28th and 30th March 1896.

MEMBERS PRESENT:

MR. H. C. HILL, *Officiating Inspector-General of Forests, President.*
„ J. S. GAMBLE, M.A., *Director of the School.*
„ A. L. HOME, *Conservator of Forests, Assam.*
„ E. P. POPERT, *Conservator of Forests, Central Circle, Madras.*
„ J. W. OLIVER, *Conservator of Forests, Eastern Circle, Upper Burma.*

MR. J. L. PIGOT, *Secretary.*

RESOLVED—

Final Examination, 1896.

1 That, on the result of the final examinations of 1896, conducted under the superintendence of the Board, certificates be awarded to the undermentioned students of the Upper and Lower Classes.

No student obtained a certificate "with honours."

I.—Upper Class.

(1) B. D'Sa.
(2) Rikeshur.
(3) N. S. Dhamdhare.
(4) Ram Chunder.
(5) W. H. Graham.
(6) G. Wrafter.
(7) W. J. Anthony.
(8) S. E. F. Jenkins.
(9) Tinkori Lahiri.
(10) Vinayak Chimnajee.
(11) O. C. Gilmore.
(12) J. W. Modder.
(13) W. R. French.
(14) B. Kelly.
(15) Hari Datt Joshi.
(16) Surendranath Chatterjee.
(17) Palecandra Woothayya.
(18) C. A. Hammond.
(19) Fazl Elahi.
(20) Jagannath.
(21) E. A. Rooke.
(22) Chintaman Vishwanath.
(23) G. K. Ambekar.
(24) D. J. Evers.
(25) Jairam Raghunath.
(26) H. B. Gawke.
(27) P. Phillips.
(28) Vasudeva Shahane.
(29) Hatim Tai.

II.—Lower Class.

(1) Sheo Prasad.
(2) Sansar Sing.
(3) Rabi Datt.
(4) Kashi Ram.
(5) Tika Ram.

2. That bronze medals be awarded to the undermentioned passed students:—

(1) W. H. Graham } Sylviculture.
(2) Rikeshur }
(3) G. Wrafter—Forest Engineering.
(4) W. J. Anthony—Botany.
(5) B. D'Sa—Forest Law.
(6) W. J. Anthony—Zoology.
(7) S. E. F. Jenkins—Herbarium.
(8) Sheo Prasad—Lower Class, General Proficiency.

[No medals were awarded for (1) utilisation and working-plans, and (2) surveying.]

3. The President placed before the Board for consideration the marginally noted communications received from Mr. J. Nisbet, Officiating Conservator of Forests, Burma, containing suggestions which may be summarised as follows:—

No. 1106, dated 21st August 1895 (forwarded to Chief Commissioner, Burma), and No. 2425, dated 5th March 1896.

(*a*) The dictation of lecture notes to students in class should be curtailed; and students should be provided with concise printed lecture notes prepared by the lecturer.

(*b*) Each lecture should be of one hour's duration, instead of ninety minutes as at present.

(*c*) "Forest Protection" should form the subject of a separate course of lectures. and the present courses of instruction in vegetable physiology and in forest mathematics should be extended.

(*d*) Zoology should be taught in the first, instead of as at present, in the second year.

(*e*) The Director should himself undertake the delivery of the lectures in certain subjects, thus permitting of the abolition of the post of Deputy Director and thereby securing a certain saving of expenditure.

(*f*) That Mr. Nisbet should, in certain circumstances, himself be appointed Director of the Imperial Forest School and Conservator of the School Circle.

The Board, after a careful consideration of these suggestions as well as of the written opinions thereon of the present School Officers and of other papers bearing upon the matters discussed, resolved as follows:—

(*a*) European experience in, and European methods of Forest instruction are not applicable to the conditions obtaining in India and to the kind of student who enters the Dehra Forest School. These students follow the lectures with some difficulty, and are often unable to appreciate important points. usually they cannot listen to lectures and at the same time take

notes. The Board and the School Officers have always been alive to the desirablility of reducing the amount of dictated lecture notes. The want of suitable text-books has hitherto been the principal obstacle in the the way of attaining this object; and accordingly the Board, at its first meeting in March 1891, took steps to obtain suitable manuals. These school manuals have been brought out for certain subjects and are now in course of preparation for others. With the publication of text-books, adapted to the school syllabuses, the students will be encouraged to note upon the more important points which the lecturer specially explains or illustrates. The Board considers it preferable that students should take their own notes to this extent rather than make use of printed notes which they would probably merely commit to memory without a proper understanding of the subjects concerned. The obligation to take notes serves to fix the attention and impress the memory in regard to the more important portions of the lectures. The members who assembled annually from 1891 to 1895 were in favour of the system in vogue or in process of development in conjunction with the issue of suitable manuals; and the present Board concurs with the School professors, who were themselves trained on the Continent or at Coopers Hill College, in thinking that no change is now desirable.

(*b*) The Board considered that no object will be gained by curtailing the duration of each lecture in order to provide time for additional subjects. A certain portion of the time is devoted to questioning the students and to discussing matters which they may not have understood. The Board concurred with the Director in the opinion that the existing system works well in practice and that it should not be disturbed.

(*c*) The subject of "forest protection" is already included in other cognate courses of lectures, and is sufficiently treated in consideration of the general standard of forest education aimed at. The question of forest mathematics was dealt with in the Board's Resolution No. 5 of 1895, and a more extended course has been recently provided. As regards instruction in vegetable physiology, the Board, after examining the students of the year in this subject, resolved that the course as taught is sufficient and that it is unnecessary to teach up to a higher standard.

(*d*) The Board agreed that it would be well if zoology could be taught during the first year's course; and desired that the Director, if he finds it possible, should give effect to the proposal in preparing time-tables in future.

(*e*) It has been acknowledged, since the School was founded, that the Director cannot undertake the duty of a professor and concurrently carry out with efficiency the dual work falling to him as Director and as Conservator of the School Forest Circle. The Board agreed with this view, and strongly deprecates any interference with the present arrangement which was approved by Government on the advice of such experienced officers as Sir D. Brandis and Colonel Bailey, R. E., and which, in the Board's opinion, has largely contributed to bringing the School to its present efficient condition.

(*f*) The suggestion that Mr. Nisbet should be appointed Director and Conservator is a matter for the Government of India, and not for the Board, to decide. The Board, however, in consideration of its responsibility in regard to the administration of the School, has separately recorded its views on this proposal, and has desired the Inspector-General of Forests to transmit them for the information of the Government of India.

Instruction in procedure and accounts and in mathematics.

4. With reference to the Board's Resolution No. 5 of 1895, and after considering the replies of Conservators on the proposal to discontinue the course of instruction of procedure and accounts and to devote the time thus secured to the further teaching of mathematics, the Board resolved that the course should not be entirely discontinued. The Board discussed the arrangement necessary for the continuance of the course and for more extended instruction in mathematics, and approved the Director's proposals to provide the necessary time partly by a re-arrangement of the existing time-table of studies and partly by discontinuing the present practice of granting to the students whole holidays on Saturdays. In future, half of each Saturday will be devoted to study at the discretion of the Director.

Museum accommodation.

5. The Director having brought to notice the insufficiency of the present accommodation for the exhibition of technical objects, such as models of forest works and appliances, tools, building materials, etc., consequent on the arrangement of the other museum collections according to subjects, the Board resolved that it will be an advantage if the two large rooms at present occupied by the office of

the Conservator of Forests, School Circle, can be made available for the purpose.

Preparation of a "Forest Flora."

6. The Board perused the manuscript of parts of a Forest Flora of the School Circle, for the use of students, under preparation and nearly completed by Babu Upendra Nath Kanjilal, Vernacular Instructor and passed Honours student of the Forest School. The book, which is approved by the Director and by Mr. Duthie, will be an useful manual when published ; but its adoption as a text-book the purchase by Government of a number of copies, or the grant of an honorarium to the author, will be for subsequent consideration. In the meantime, however, the Board recorded its appreciation of the work, which is, so far as it is aware, the first of the kind brought out by a native.

Results of final examination in surveying and forest engineering.

7. The Board was struck with the gradual decline in the average marks obtained by students during the past five years in surveying and forest engineering. These marks are as follows :—

Average marks in finals.

	1892.	1893.	1894.	1895.	1896.
Surveying (300)	195·1	189·6	181·5	183·4	175·9
Engineering (300)	159·4	157·7	154·9	151·5	146·1

Enquiry pointed to the diminution being due to the following causes:—

(*i*) To a falling off in the general educational qualifications of candidates for admission, in consequence of the senior men, already in Government service, having all passed through the School previous to 1892, and because the prospects held out by a reorganisation of the Subordinate Forest Staff have not yet been realised.

(*ii*) To a gradual expansion of their lectures by the Instructors.

The Board accordingly resolved that the courses of surveying and forest engineering should be restricted within such limit as may be necessary to enable the students to attain to that standard which conforms to their capability for assimilating the instruction given.

Instruction in physical science.

8. The Board having noticed during the final examinations the low marks obtained by the students in physical science, resolved that the attention of the Director and of the Instructor charged with the lectures should be drawn to the desirability of simplifying the course. It desires that more stress should be laid on thoroughly grounding the students in elementary principles by

practical illustration and experiment in both class-room and laboratory.

Additions to School Rules Nos. 4 and 22.

9. The Board resolved that the following additions be made to the School Rules:—

(*i*) Rule 4 ; under "5 Zoology," after "insects" insert "their dissection," and alter "including" to "and."

(*ii*) Rule 22. Insert as third and fourth clauses of this rule :—

"No student is allowed to be absent from his quarters after 10 P.M. without the permission in writing of the Director ; and any student found outside after that hour will be liable to punishment even to dismissal.

"Separate cook-rooms are provided for students of all religions and castes, and these rooms will be allocated from time to time by the Director. Christian students must use the dining hall for meals, and, without special permission, will not be allowed to take their meals in their own quarters.

Private Ex-students of the Forest School available for Employment.

We have received from the Inspector-General of Forests his Circular 5 of April 20th, 1896 giving the following list of passed students who are looking for employment.

Upper Class.—1. W. H. Graham ; 2. S. E. F. Jenkins; 3. W. R. French ; 4. H. B. Gawke ; 5. P. Phillips ; 6. V. R. Shahane, and we would add, from 1895, P. E. Plunkett and J. A. Wallinger.

Lower Class.—1. Sheo Prasad ; 2. Sansar Singh ; 3. Kashi Ram.

We shall be glad to give information regarding any of these, so as to help them to obtain work in the Department and in Native States and zemindaries.

IV.—REVIEWS.

Durability of Railway Sleepers.

The statement shewing the results of the experiments on the durability of railway sleepers takes us to the end of 1894.

On the Ajmere-Khandwa section of the Rajputana-Malwa Railway one of the earliest experiments was commenced in 1876. At the end of 18 years, we find the following percentage of sleepers still sound :—Deodar 94, Anjan 34, Teak 28, Creosoted Pine 24, of 1894, and Sal 20. Supposing all the sleepers remaining in use at the end had to be removed during 1895, then the average duration of deodar would be 18 years, and that of sal 16½.

On the Rewari-Ferozepur section of the same Railway, an experiment of 1882 in which 1166 deodar sleepers were concerned shew that only 34 per cent. remained sound after the lapse of 12 years; whereas on another section, in the experiment of 1884, out of 12,000 deodar sleepers, 98 per cent. were still in the ground at the end of 1894.

In two experiments completed on the Eastern Bengal Railway, sal lasted 7 and 11 years on an average.

On the North Western Railway the earliest experiment dates back to 1877, and in the 17 years elapsed since then, we find that 70 per cent. of the deodar sleepers are still in use; and on the supposition that *all* the remaining sleepers proved unsound in 1895 and had to be removed all at once—which is most unlikely—then the average durability of deodar on this railway would be 16 years. According to the number of sleepers which remain sound after 1895, so would the average durability increase. Hence, in two of the principal experiments, we know for certain that deodar will last 16 and 18 years as a minimum, and by the time these experiments are brought to a conclusion it is not improbable that 20 years will be the average life of a deodar sleeper. There is no other wood in India of which this can be said, as far as we know at present, and it behoves the railway authorities when applying for deodar, to see that they get it, and not to allow the wood of other pines to be surreptitiously mixed with it.

A. S.

Forest Administration in Hyderabad.

We have received the Annual Report of the Forest Department in His Highness the Nizam's Dominions for fasli year 1303 which we suppose is our official year 1894-95. It is written by the Conservator, Mr. W. Fraser Biscoe.

We gather that there are four Divisions bearing the names of the cardinal points of the compass, but the returns are mostly given for Divisions bearing the names Warangal, Bidur, Gulburga and Aurangabad, and these are also quoted in some places in the Report, which is rather confusing.

The Reserved Forests are in two classes: *first* those where preliminary demarcation has been completed; *second* those not yet demarcated. The area of the Reserves is apparently not given, even approximately, but four areas of large size aggregating 3,490 square miles were placed under the department as State Reserves during the year.

'Bijasal' (*Pterocarpus Marsupium*) seems to be the most valuable reserved tree, but teak is also found, as well as some sandal, ebony, and satin wood, the 'nulla muddy'. (*Terminalia tomentosa*), the 'Yeppa' (*Hardwickia binata*) and last but apparently not least the 'Kodarsi' (*Lebedieropsis orbicularis*), which is said to coppice splendidly under almost all circumstances, even after fire.

Fire-protection has not yet commenced, but apparently is only awaiting the completion of the outer demarcation lines and a proper network of inner fire-lines. The regulation of grazing is beginning, especially with the exclusion of goats from some of the forests.

The financial results of the year were :—

Revenue ...	...	Rs. 1,31,064
Expenditure ..	...	,, 96,182
	Surplus ...	34,882

We are glad to see that some five Forest Rangers from the Dehra Dún Forest School are reported to be doing good work.

Annual Forest Administration Report for Madras, 1894-95.

This is a much more business-like Report than usual, and there are features about it which might with advantage be adopted in other Provinces, especially in those where there are several Circles. There are only 40 pages of Report, 18 pages of Appendices which are practically Reports, and 42 of returns which have been very greatly boiled down, perhaps in some cases, too much so. The list of Reserved Forests and their areas, as it is usually given, is a useful record to turn to, but this Report only gives totals for the Districts. The return of area of Plantations is also given for the Districts only, so that to anyone who looks for the area of Nilambúr it is a little disappointing to find only the entry of 16 plantations, area 4,439·33 acres (how good it is to be accurate to the second place of decimals!) and cost to date, Rs. 2,83,576. For aught we know, this may include ever so many other areas miles away from Nilambúr. But although we may doubt the expediency of concentrating the statistics too much in these cases, we are very glad to see the great shortening and simplification of the timber returns which in some reports so uselessly take up numerous pages, which will scarcely ever be looked at again. The Report itself has been this year prepared by the Conservator of the Central Circle who is *ex-officio* the Forest Secretary to the Board of Revenue, and is submitted as the Report of the Board. The consequence of this is that it is good

and brief and to the point. In the Introductory Chapter are some remarks on the well-known Resolution of October 1894 in which it is said :—

"During the year under report the Government of India 'issued a Resolution enunciating the principles which should be 'observed in the administration of all State forests in British 'India. The main object aimed at was the relaxation of restric- 'tions imposed upon grazing and upon the use of minor produce 'generally. These principles had been anticipated in this Presi- 'dency and the necessary provision for giving effect to them 'had also been made in the revised rules under section 26 of the 'Forest Act. Doubts having been entertained regarding the 'applicability to this Presidency of certain suggestions of the 'Government of India, particularly with reference to the manage- 'ment of minor forests and grazing grounds by the resident 'cultivators independently of the Forest Department, a reference 'was made to the Government of India. Finally it was decided 'to adhere to the policy laid down in 1890 and to retain under 'the department all classes of forest reserves, the minimum 'area of each reserve being ordinarily fixed at one square mile."

The area of Reserved Forest at the close of the year was 11,466 sq. miles and of Reserved Lands 7,324 sq. miles, the total being nearly 20 per cent. of the total area of the Presidency, excluding zemindari and inam villages. To the area of Reserved Forests must be added 5,313 sq. miles under settlement, making 16, 779 sq. miles in all. Settlement work is going an slowly, but if slow it is sure and once done ought to save much future trouble and possible litigation. On the sufficiency of the area reserved the Report says :—

"With regard to the adequacy of reservation, all that can 'be said is that schemes have been carefully prepared for most 'Districts, though they are still under preparation in a few. 'The progress made in working out these schemes has been 'noted above, and when settlement has been completed, the area 'under reservation will comprise all that could be secured without unduly trenching on the areas available for village grazing 'and the extension of cultivation. Of course there are some 'Districts in which the area selected for reservation is much less 'than it would have been if the work had been taken in hand at 'the beginning of the century, but as regards the Presidency 'as a whole, it may confidently be said that the reserved area 'will be adequate for all requirements which ought to be met 'by State Agency, though many of the forests will require years 'of rest and careful treatment before they can become financially 'profitable."

We are very glad to see the last remarks, for it occasionally happens that Revenue and other officers who do not personally know the capabilities of forest areas are liable to assume that they

are well-stocked and capable at once of supplying all possible demands, even to the extent of large mature building timber, and of yielding a large financial surplus.

Demarcation seems to be going on well and to be thoroughly done, and we are glad to see that the *cleared lines* are evidently considered of more importance than the boundary *marks* which in some Provinces it is customary to commence with, leaving the lines themselves to be done at any time. Without good cleared lines, encroachments are always possible, and it is absurd to expect a cultivator to know exactly when he is outside or inside of the boundary. The Report says that "the nature of the per-'manent demarcation adopted in almost all the Districts consists 'of a broad cleared line with stone, or earth mounds where stone 'is not available. In some Districts stone slabs or stone pillars 'are also adopted for boundary marks. The width of the cleared 'line varies according to the needs of the District. Generally 'it is from 10 to 15 feet, but in Tinnevelly it is 18 to 20 feet and 'in Nellore 30 feet."

Working Plans are still, as we suppose cannot well be helped while settlement work is going on, more or less behindhand, but we are glad to see that the Government is urging simple plans based upon *area*, instead of waiting for more elaborate ones based upon *material*. At the same time it is doubtless quite sound to collect statistics regarding rate of growth, for otherwise rotations are difficult to fix. In Vizagapatam it was found that the coupes in the Peddapalli Reserve, which consists, we believe, merely of quite small growths, gave 135 tons of firewood and small timber from 77 acres. In Kistna District the mangrove forests gave, for two years, on 8,688 acres 7,655 tons of fuel, realizing Rs. 19,155. In Tinnevelly, 14 tons per acre were given by the coupe in the Pápanásam Forest. In Nilgiris it has apparently been discovered that the plantations have so much competition to meet from private forests that it will be best to convert their out-turn into charcoal.

Fire protection was apparently very successful during the year, for 4,979 sq. miles were attempted and 94 per cent. of the area successfully.

Very full notes are given on the interesting subject of *Natural Reproduction*, which Mr. Pollert has summarized as follows:—

"The natural reproduction of Sâl (*Shorea robusta*) in *Ganjám* 'continues to be excellent. In *Vizagapatam* and *Gódávari* gene-'ral reproduction in closed areas continues to be satisfactory; 'and in *Bellary* the result was on the whole poor, though date 'and palmyra in parts and coppice re-growth in felled compart-'ments were coming on well. A fair crop of seedlings showed 'themselves in *Kurnool* in the fire-protected areas. In *Cuddapah* 'there was no improvement in the seeding of red sanders (*Ptero-*

'*carpus santalinus*. *Hardwickia binata* and *Anogeissus latifolia* 'are the only two important trees which appear to regenerate 'themselves naturally from seed at all successfully. The growth 'generally from coppice was however good. In *South Arcot*, 'except sandalwood, reproduction from other species from seed 'and coppice continues encouraging. The natural reproduction 'from seed in *North Arcot*, *Salem* and *Madura* was unsatisfac-'tory, except in specially-protected areas, though it came up well 'from coppice. In *Tinnevelly*, regeneration of teak from coppice 'was good. A large number of sandalwood seedlings is reported 'to have sprung up and to thrive well in this District as also in '*North Coimbatore*. Reproduction in *South Canara* is said on 'the whole to be improving. Bamboos have seeded generally in 'most Districts and the reproduction is very satisfactory. Mr. 'Popert inspected the teak forests of the Anamalais (South Co-'imbatore District), Mudumalai and Beni (Nilgiri District) and 'submitted suggestions supplementing or modifying the systems 'of working adopted of late years. All these forests have been 'overworked in former times and little mature or sound teak 'remains. The teak reproduction is poor, but Mr. Popert is of 'opinion that the forests contain sufficient young growth to even-'tually form their chief peuplement."

In the remarks on *Artificial Reproduction* the most noticeable thing is the reduction of the cost of Casuarina planting in the Central Circle, where 90 acres were done in Nellore at an average cost per acre of Rs. 10, and 115 acres in South Arcot at Rs. 9 per acre. In the matter of experiments and the growing of exotics much is being done, but it is not very systematically carried out apparently, the most important trees tried being the new mahogany (*Swietenia macrophylla*), and the date.

The financial results of the *forest year* were :—

Revenue	...	Rs.	19,77,182
Expenditure	...	„	14,54,298
Surplus		„	5,22,884

only a small amount of which was given by the Southern Circle, others the being nearly the same.

The Government Review is full and good and we are glad to see that they acknowledge the services of the Conservators and District Forest Officers.

VI.—EXTRACTS, NOTES AND QUERIES.

The future supply of Indiarubber.

Some twenty years ago sinister rumours as to the depletion of the rubber forests of South America caused a new departure

in economic botany, namely, the systematic planting of rubber trees, and the results may be considered satisfactory as far as the possibilities are concerned, although the garden product, as we may term it, has not yet entered into serious competition with that from untended nature. The question now arises as to whether all the time and trouble has been expended needlessly or not. From what has appeared recently in the American technical press, this would appear to be the case, and it seems of some interest to briefly recapitulate those criticisms on what is almost entirely an English enterprise. Attention is drawn to the fact that vast forests of rubber trees exist untapped, and that any fear of curtailment of supply is illusory. This statement is supported by the fact that the market price of rubber remains practically stationary, while the demand has largely increased of recent years. A critic remarks that there is no good in doing what nature has already done so well for us; and another practical man, when asked why he did not support the rubber plantations, made answer by the query, "Why do I not go in for the cultivation of coal?" These and similar remarks go to show that in America there is no fear as to the supply running out, and that, therefore, any precautionary measures which prudence might dictate are unnecessary and uncalled for. The American business man cannot see any pressing need for the movement under consideration, and he is unwilling to embark his capital in an affair the benefits of which, to him at any rate, are so problematical. With regard to this point of unlimited supply, it may be noted that recent travellers in the upper parts of Brazil report that there is a large unworked area of rubber forests in the watershed of the Orinoco, and even where the forests are worked it is only in rare instances that more than the borders of the stream have been tapped, no trouble being taken to get spoil from the higher regions. Further than this: there is a constant succession of trees arising from seeds. Count de Berthier has expressed the opinion that the Venezuelan forests could be made to yield 1,000 tons of the best rubber per annum if carefully worked, and is supported in his optimistic tone by what the Baron de Marajo has written in a recent number of the New York *India Rubber World*.

In Africa, although the supply is abundant, the want of navigable rivers has acted prejudicially against the due expension of the trade, as under the conditions of porterage at present obtaining in many localities, the natives find it unprofitable to carry rubber any distance to the coast when the item of paying tribute to the various tribes encountered *en route* has to figure in profit and loss accounts. While on this matter of Africa's addition to our supply, we should like to take the opportunity of referring to the statement of M. Chapel that if the African rubbers were collected and prepared for market by the more enlightened methods in vogue in South America, the resulting product would be

equal to the best Para rubber. We confess to a mild feeling of surprise at this statement, and consider it a bold assertion which is not supported by the facts of the case, though, as it must be remembered that some kinds of African rubber are much superior to others, the author quoted may have had in his mind the best of the African sorts. As regards the bulk of the rubber, that from the *Landolphias* or the species of *Ficus* found on the west coast, we think the day is very far distant which will see them improved to the standard of Para rubber, though we certainly do not doubt that some amount of improvement is possible, and indeed, to our own knowledge, this has been effected of recent years in the case of the Lagos rubber, which, though at first practically worthless, now fetches a fair price in the market. However, we are rather wandering away from the lines of this article, and to return to the critics of the rubber plantations, it may be noted that they prognosticate great difficulty in obtaining labour if the plantations are carried out on anything like a large scale. The Indians, it is asserted, will not change the whole course of their lives and submit to the entire revolution of their methods of work, while it has been amply demonstrated that Europeans or Asiatics are incapable of sustained work in the climate. Other objections have been urged, but in face of the chief one, *viz.*, unlimited supply, there seems but little use drawing attention to them. The case then seems a tolerably clear one for those who argue that rubber plantations are not warranted, by the facts of the case. In passing judgment, however, on those who, in the light of recent discoveries, may seem to have acted somewhat precipitately, and without the exercise of due foresight, we should, of course, bear in mind that the common facts of to-day were not the common facts of 10 or 20 years ago. The discovery of these rubber forests is of recent date, and it cannot, therefore be pointed at as an overlooked factor in the original consideration of the matter. It will be remembered by those interested that the representations made to our Kew authorities as to the depletion of the rubber forests, were couched in distinctly alarmist language, and therefore they quite merited the measures taken by the India office. Of course it was possible for our Government to have undertaken such explorations as to have recently been made by private individuals, and this would probably have resulted in the alarmist rumours being somewhat discounted as we may presume that the forests of to-day existed in much the same condition 20 or 30 years ago. However, it is easy to be wise after the event, and we shall certainly not be found in the ranks of those who seek to throw ridicule on the whole movement, because, whether the expense and trouble which our Kew authorities have been put to, seem warranted or not at the present time, it has certainly been shown that rubber trees can be successfully acclimatized and grown in India and other districts far remote from their original *habitat*,

and occasion may yet arise when the information thus gained may prove of much value to the indiarubber industry.

Comment by an American Importer.

A gentleman thoroughly familiar with the conditions of trade and industry in Central and South America entertained somewhat different views from the above. "While," said he, "it is true that not much capital, American or foreign, is invested in rubber plantations, the question is certainly in the air, and before long the vague notions and ideas on the subject will assume practical shape. The rubber countries are poor and naturally anxious to attract capital from outside to develop their industries and resources. On the other hand, it is beginning to be felt that some measures have to be taken to insure the future supply of the ever-increasing demand for rubber. As population grows and as new applications or extensions of old applications of rubber in industry, are made the demand for rubber increases, and it is a short-sighted policy to depend on existing rubber forests, which surely cannot last for ever and access to which must become more and more difficult and expensive. Not only will rubber plantations be needed, but there will be more profit in them than in going to the inaccessible forests for the supply. The business world is not entirely ripe for it, but the subject is in the air, and you may expect to see the starting of a great many enterprises in that direction before many years go by. It is, however, to American capital that we have to look for this. Foreign capital will not go into anything, the price of which is controlled by this country. We consume two-thirds of the rubber product of the world and hence control prices. In twenty years our consumption has risen from less than ten millions to not far from forty millions. The rubber countries look to us for capital. The natives in South and Central America have already begun the planting of rubber trees, and a traveller will meet here and there plantations of considerable importance. But American capital will do the real work when the time is ripe. There is, however, one serious drawback —the lack of labour. There is no civilised population in the rubber districts and the Indians cannot be depended on for regular, systematic, and continuous application. They are not accustomed to order and discipline, and they will work in their own way, getting drunk or loafing whenever it suits them."—*India Rubber World.*

Deputation of Mr. Slade to Siam.

Says the "Révue des Eaux et Forêts :

"We hear with pleasure that Mr. H. Slade, acting as Conservator (*sic*) in Burma, has been sent to Siam to organize a Forest Service. Mr. Slade, who was at the Forest School (Nancy)

'in 1880, may one day find himself on the right bank of the Mekong 'at the same time as one of his French comrades on the left bank, 'if we soon organize a Forest Service in Indo-China. There are 'great quantities of building timber in Siam for exploitation, while 'the export of teak from Chiengmai was already as high as 71,500 'logs in 1894. It is due to a report from the British Consul at 'Bangkok that the Siamese teak trade has continued to develop. 'At Saigon the demand for Siamese wood is increasing; in 1894 'three hundred and ninety tons were received ; and now they are 'negotiating a purchase of 1,300 tons at Bangkok, the wood being 'destined for the naval dockyards at Toulon, *viâ* Saigon."

The destruction and repair of Natural resources in America.

By John F. Lacey, M. C., Oskaloosa, Iowa.

The people of this continent do not sufficiently appreciate the immensity of the period that nature employed in building the New World and preparing it as a home for civilized man, nor how easily those advantages may be destroyed. When first Columbus set his foot upon these shores the vast forests and splendid prairies lay rich and inviting as the home of the coming race. The forest, which has done so much to prepare the earth for man's use, was encountered by the early settlers along the whole Atlantic shore. The necessity of clearing away this vast mass of vegetation led the pioneer to look upon the woods as the enemy of man. The axe was used unsparingly, and but few specimens of the original continental forests still remain.

Trees have their poetic as well as their practical side. While sensible to their beauty, we are now deeply concerned in their utility. All they have asked heretofore has been standing room. Give them but place, and they will patiently do their work. Their long arms have reached out for ages, and gathered from the air the elements of growth which they have added to the soil. As one poet has expressed it :

> "Cedars stretch their palms like holy men at prayer ;"

and another speaks of them in winter,—

> With their bare arms stretched in prayer for the snows."

They gather the sunshine year by year and store it away for future use. They fertilize the soil ; they beautify it.

In a few old churchyards on the eastern shore of Maryland may be seen the remains of the splendid forest that once covered that region. The sight of these specimens makes us regret that

larger areas of the ancient forest had not remained untouched. It was necessary to cut down a part of the forests, but man has swept them from the earth with the besom of destruction.

We are beginning to realize the wastefulness with which we have treated the gifts of nature. We found this continent a storehouse of energy and wealth. The climate was salubrious. The soil was fertile. The forest spread on every hand. The rivers teemed with fish. The earth and air alike furnished supplies of game. Great coal deposits were found in almost every State. Coal, oil and natural gas arose to the explorer from the bowels of the earth.

The prodigality of the sun is something amazing. When we think how few of its rays strike the earth or any of the planets in proportion to those that are constantly shed from its surface we are led to wonder if they ever can be exhausted. Man is as prodigal of his natural possessions as the sun of its heat, light, and energy. We have not been content with improving upon nature, but have acted the spendthrift part, in wasting her stores. The coal has been preserved in spite of man by vast strata of earth and stone, and there has been less wasteful extravagance in the use of this valuable mineral than, perhaps, any other of nature's gifts, and yet we are beginning to compute the time when the anthracite will only be found in the collections of museums. The coal oil has been wasted, and wells have been opened and fields destroyed as though the supply was inexhaustible. Natural gas deposits have been tapped, and the wasting gas set on fire, lighting the country for miles around. These vast stores of nature's forces are being rapidly exhausted.

It has not been so very long ago that terrapin were so plentiful in Maryland that it was found necessary to enact a law preventing masters from feeding their slaves more than a given number of time, each week upon that toothsome viand. Terrapin three times a day, three hundred and sixty-five days in a year, was found to be monotonous. No such law would be necessary now. In Connecticut the law forbade that an apprentice should be required to eat salmon more than twice a week for the same reason that the slave was protected against too much terrapin. Now the Connecticut salmon is a delicacy for the rich alone.

The extermination of the buffalo is too recent and too shameful to speak of excepting in the highest terms of indignation. Instead of taking these vast herds and, after giving them proper marks of identity, dividing them up and assuming proprietary rights over them, they have been slaughtered by the hundred thousand for the sheer pleasure of killing, until now a little handful of two or three hundred is all that is left of the millions which roamed the plains forty years ago ; and this was called sport. It required nothing like the expert skill of the pig-sticker, who, covered with blood presides over the scenes of carnage in one of our great slaughter-houses.

The same indiscriminate slaughter which has practically destroyed the salmon of Connecticut has been followed on the Columbia. Fish-wheels along the banks of the stream have been throwing out of the water enormous quantities of the most beautiful fish in the world, catching them at the very time when they were *en route* to the headwaters of the stream to deposit their spawn. Legislation upon the part of Oregon and Washington has at last been reluctantly enacted in time, I trust, to save these fish from extermination.

It is to the forests that we wish more particularly to direct our attention at this time. But the streams are the children of the forest, and the fish are the children of the streams. In the early days men often cut down trees for the wild fruits that grew upon them. The beautiful service-berry has been well nigh exterminated by this barbarous practice. This was a sin against nature. A few years ago I visited the great region of the Northern Pacific Coast, where to-day is perhaps the grandest forest now remaining on the face of the earth. It can no longer be described as

> "the continuous woods
> Where rolls the Oregon, and hears no sound
> Save his own dashings;"

for the hand of man is busily engaged in building up new States in that splendid country. Arriving upon the cars at The Dalles some one said to me to run out quick and I would see Mount Hood. I presumed Mount Hood was one of the permanent features of Oregon and I saw no reason to be excited or to hurry to see it, and took a little time to go to the point where the peak could be seen through the open street. I watched it for a moment and then the smoke and fog covered it. It was the first and last glimpse I ever had of Mount Hood. The whole country was covered with a pall of smoke. The same "improvement" was being perpetrated there as in early days on the Atlantic Coast. The promised destruction of the world by fire was progressing.

Splendid trees, five and six feet in diameter and hundreds of years of age, were being destroyed. Auger holes were bored in the tree near the ground, coal oil poured in the holes, a match applied, and the tree burned down. Other holes were bored in the body of the tree, and with the assistance of more coal oil a splendid tree was soon reduced to ashes. During the dry season these fires were permitted to escape and pass through the forests, covering and concealing the whole earth with a cloud of smoke, and rapidly working in this new field the same useless destruction which has followed in man's footsteps in every part of the continent.

This sin on the Pacific Coast is only greater than that which was committed on the Atlantic shore, because the forests are finer, and the mistakes made in the wanton destruction of

the timber in the East ought to have been a warning in the West. They have an awful example to shun and not to follow.

In the hills of Virginia and West Virginia I remember in my boyhood days the little streams that were fed by springs, and favorite swimming holes could be found along them all. They were full of fish, and a source of delight to the young and old. After forty years' absence I re-visited some of the same old streams. The trees had been cut from the hillsides. The springs had dried up. The old swimming holes were gravelly and sandy wastes,—as dry as Sahara, except where the channels were filled with muddy torrents for a few hours after a big rain.

In the older settled parts of the country the same condition of things occurred much longer ago.

I believe it was in 1842 that Doctor English described a a similar condition, asking his old schoolmate to remember—

> "The shaded nook by the running brook
> Where the children went to swim.
> Grass grows on the master's grave, Ben Bolt,
> And the spring of the brook is dry."

This wail touches the heart in every part of the settled portions of the country.

In Central and Southern Italy the Apennines are a striking illustration of the results of forest destruction. The ghastly seams into which the rains have washed lands that were once as fertile as any in the world have utterly destroyed much of that country for agricultural purposes. Surrounded as Italy is by the Mediterranean, the effects upon her climate have not perhaps been as bad as would follow in the interior part of the continent. But nature seems to have given up the struggle with man, and Hawthorne tells us that where man's hand has carved a stone in Italy its reclamation from nature is permanent, whilst in the north of Europe, or in the British isles, nature claims its own again, and covers the bricks and rocks with moss, lichens, or ivy.

Nothing is so beautiful as a running stream in a state of nature. It is a living thing, always sparkling, never growing old. The brook, where the forests still protect it from destruction in its course to the sea, is a symbol of eternity To the poet it says—

> "Men may come, and men may go,
> But I go on for ever."

But in the land of the Holy Writ, where the forests were but few, the brook was no such type of constancy. In Job, the brook is described as an emblem of deceit, frozen up in the winter and dried up in the summer: "My brethren have dealt deceitfully as 'a brook, and as a stream of brooks they pass away. * * * The 'paths of their way are turned aside; they come to nothing and 'perish."

The brook that Horace describes in his journey to Brundusium still flows in the same banks, and seems like a living thing, speaking of the poet of two thousand years ago.

The Hon. Timothy Brown, one of the leading lawyers of Iowa, has a discouraging theory which he supports with a considerable array of corroborating facts. He assures us that the magnetic pole is moving eastward at the rate of seven miles a year, and as it moves the area of drought in the Rocky Mountain region progresses at the same rate, and in due time Ohio will be as arid as Wyoming or Nevada.

We must not mistake mere weather for climate. We may have a scarcity of rainfall, and that scarcity may become serious enough to lead us to apprehend a dangerous permanent change of climate, whilst it may be true that a similar condition of things has prevailed many times in the past in the same region, followed by a return of sufficient moisture.

But it seems to be the united opinion of all ages and in all countries that rain produces forests, and that forests produce rain; that great and injurious changes of climate almost certainly follow any sweeping and general destruction of the woods.

Trees set out along hedge rows will undoubtedly do much in ameliorating climatic conditions, but great masses of forest, where considerable regions are shaded and protected, are essential to the preservation of the climatic conditions that have brought so much prosperity to this country in the past.

In the North-west the last few years of drought have prepared the people as a whole for the study of this question. The shrinking of the Great Lakes is already plainly noticeable, and active efforts for their preservation and restoration should be made without delay.

In Iowa some of the most beautiful of the little lakes have been drained and turned into fertile fields, whilst others have dwindled so as to be only a mere reminder of their former beauty. If the destruction of these bodies of water only entailed the loss of their beauty, a practical people might accept the change without any very great regret; but when the reclamation of a comparatively small area of land to cultivation imperils the water supply of thousands of surrounding farms, it is high time to call a halt and demand a restoration of these sources of water supply. All land must at time lie fallow. The best rest that it can enjoy is when covered with timber, it returns for a time to its natural condition sheltered and fertilized by the woods once more. A reasonable portion of the country should at all times be thus given up to its native woods if we would preserve the fertility of the whole.

The practical question of to-day is how, as far as possible, to undo the mistakes of the past; how to prevent them in the future. Agitation and discussion are necessary to call the attention of the people to the importance of maintaining and to at least partially restoring, the primitive forests of this country. The recent policy of

withdrawing from settlement or sale large regions upon the headwaters of streams, and creating forest reservations, is the greatest step in the right direction that has thus far been taken.

We must give up some part of our country to nature in order to keep the remainder for ourselves. The policy of most of the old States in regard to timber has been well summed up in six words: "To get rid of the timber."

With wood used for nearly every purpose from toothpicks and matches up to great grain elevators and ship's masts, the proper and reasonable requirements for man's necessity and luxuries involve great and constant encroachment upon our forests. The old backlog of our forefathers has given place to the terra-cotta gas log of a new generation.

With barbed wire for fencing, and the decrease of wooden houses in the larger towns and cities, the overworked forests ought to have some rest. But the increase in population and the wear and tear upon old buildings make such calls for timber that, of necessity, a great drain upon the old forests continues.

Our fathers cut down beautiful black walnut trees for rails, and our own generation has pulled up the old stumps of the same tree for furniture making.

The peasants of France during the Revolution, it is said, would cut down two trees to make a pair of wooden shoes. Mark Twain, a few years ago while in Paris, promised to send as a wedding present to a friend the rarest and most expensive thing he could obtain in that city, and selected two small logs of fire-wood for that purpose, and, tying them together with red, white and blue ribbon, laid them among the bric-a-brac at the wedding reception.

We ask ourselves what remedy we should adopt in America. This is more easily asked than answered. To call the attention of the people to the mistakes of the past before it is too late will lead to a conservation of groves and forests still in existence. The destruction from fires has already attracted much attention, and rigid laws to prevent them have been enacted in every State.

Groves and small wood-lots upon each farm will, in some measure, repair the loss of the more extensive woods, but there must be considerable areas of country in which the forest must take control if we would preserve the climate, the springs, the streams, the soil, the birds, and the fishes. Even now the business of sinking wells for farm use to a depth of several hundred feet is being actively carried on in the West. The surface water is disappearing.

Private owners cannot perform the duty of forestry in America. We have no rich old families who from generation to generation have been able to set apart large tracts of land for the growth of trees. We have none of the beautiful old ruins that grace so many parts of the forest-planting kingdoms of the Old World. We

have no ruins more picturesque than a defunct bank, a bankrupt insurance company, or a railway in the hands of a receiver. No baronial game preserves are set apart in America. Only the Government lives long enough to plant trees extensively. The private individual is too constantly reminded of the fleeting character of life to lay out a forest for succeeding generations. The Government alone can hold tracts either long enough or large enough to effect the great climatic purposes involved in the preservation of our forests. A great step in this direction was taken in the laws providing for timber reservations. These reservations should be kept for use and growth. A thorough system of cutting of this timber ought to be provided for at some time in the future when the wants of the people require that the ripened or dead trees should be utilized. But this should be done with such system as to preserve them as a whole.

The people should be taught the value of these reservations by thorough education upon the subject. Arbor Day celebration and the planting of fruit and timber trees will lead a new generation to realize that the forest is not the enemy of man, but his fast friend —a friend without whom nations cannot expect to prosper.— (*Proceedings of the American Forestry Association.*)

Obituary: Mr. Rhodes Morgan.

The following extract from the "Madras Mail" gives the particulars regarding the death of this well-known Forest officer, Deputy Conservator on the Madras List. For his account of his last tour in the jungles of South Africa, a tour which cost him his life, we may refer our readers to his paper in this and last month's numbers, a paper which under the circumstances we feel sure all Forest officers will read with interest and regret for the sad ending of the expedition.

"We much regret to have to announce the death at Ootacamund on the 2nd instant of Mr. Rhodes Morgan, F. Z. S., District Forest Officer, aged 43. Mr. Morgan joined the Service in August, 1870, when he was posted to the Kurnool District, and he subsequently worked in Trichinopoly, Coimbatore, Malabar, Nilgiris and Tinnevelly Districts. In 1887 he was placed on special duty in connection with certain Forest Appeals in the Courts of Tellicherry and Calicut, and afterwards on similar duty in connection with Forest Settlement. The deceased had been in a precarious state of health for some time, and but faint hopes were latterly entertained of his recovery. He was suffering from fever and liver complaint contracted in Central Africa, and under went two operations, but unfortunately without avail."

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

4th May 1896.

EAST INDIA TEAK.—The deliveries for the first four months of 1896 amount to 7,181 loads against 3,362 loads for the same period in 1895. In April, this year 1,423 loads were delivered against 1,436 loads in April, 1895. Wholesale business has been checked by the higher prices asked for cargoes, but it must be remembered that much as prices have lately risen, they have been standing for some years at rates which are below the intrinsic value of the wood. The London consumption has been practically on a level with that of the corresponding month of the last year.

ROSEWOOD.—EAST INDIAN.—For really good lots, in small lots, fair prices are obtainable, but the demand is not active, and there is still some stock on hand.

SATINWOOD.—EAST INDIA—Is low in stock but demand principally for figury logs.

EBONY.—EAST INDIA.—Small parcels of really good logs would sell well.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£6	to	£10
Satinwood	„ s. foot	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, April, 1896.

Cardamoms	per lb.	1s. 5d.	to	1s. 9d
Croton seed	per cwt.	47s. 6d.	to	50s.
Cutch	„	17s	to	32s. 6d
Gum Arabic, Madras	„	16s.	to	33s. 6d.
Gum Kino	„	£20	to	£25.
India-rubber, Assam	per lb.	1s. 10d.	to	2s. 1½d.
„ Burma	„	1s. 4d.	to	1s. 11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.
„ Jubbulpore	„	3s. 9d.	to	6s.
„ Godavari	„	2s. 6d.	to	4s. 6d.
Nux Vomica, good	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	„	£4	to	£4 10s.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	70s.	to	95s.
Tamarind	„	6s.	to	7s.

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, Bareilly and Delhi, for the month of April 1896.

Description.	Timber scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sâl 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sâl and Sain. &c., Karis 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0			
{ Sain	30 0 0	40 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sâl, 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sâl and Sain, &c., Kuries 12′ × 5″ × 4″ ...	30 0 0	40 0 0	..	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	40 0 0	100 0 0 500 0 0	
BAREILLY.					
Sâl 10′ Tors (Poles) ...	5 0 0	10 0 0	...	.	
Sâl and Sain, &c., Karis, 12′ × 5 × 4″	{ 25 0 0 { 40 0 0	{ 35 0 0 { 50 0 0	... ...	.. ..	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	..	...	50 0 0	137 0 0	
DELHI.					
Sâl, 10′ Tors (Poles) ..	7 0 0	10 0 0	..	...	
Sâl and Sain, &c., Karis, 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0	...	...	
{ Sain...	25 0 0	30 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	9 0 0	10 0 0	..	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	25 0 0	75 0 0	

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Working Plans in the Southern Circle of the Bombay Presidency.

THE Southern Circle of the Bombay Presidency comprises the following Forest Divisions :—

(i) Colaba ; (ii) Belgaum ; (iii) Kanara, (iv) Dharwar, and (v) Bijapur.

2. The whole of the Colaba District, consisting of (1) Karjat, (2) Khalapur, (3) Panvel, (4) Pen, (5) Alibag, (6) Nagotna, (7) Roha, (8) Mangaon and (9) Mahad ranges, has been organized. Kanara District is divided into three Divisions, Northern, Central and Southern. The Northern Division of Kanara comprises the Haliyal, Supa and Karwar ranges, of which the organization of the parts of Supa and Haliyal has been completed. The Central Division of Kanara consists of Yellapur, Mundgod and Ankola ranges, of which parts of Yellapur and Ankola are now being organized. No systematic working-plan has been attempted in other divisions or ranges, but there is a working scheme of some sort, under which they are worked from year to year.

3. A working-plan for Karjat and Khalapur was prepared by Mr. T. B. Fry, Deputy Conservator of Forests, under the Honourable Mr. Shuttleworth, when these two ranges belonged to the Northern Circle ; and one for Panvel, Pen, Nagotna and Alibag, was prepared by Mr. H. Mitra, Extra Assistant Conservator of Forests, under Mr. J. L. L. McGregor ; these two plans have been sanctioned by Government. A working-plan report for Roha, Mangaon and Mahad, written by Mr. E. G. Oliver, Deputy Conservator of Forests, under Mr. J. L. L. McGregor, is now on its way to Government. In the Northern Division of Kanara parts of Haliyal and Supa comprising 9 series have been organized by Mr. T. R. D. Bell, Deputy Conservator of Forests, under Mr. McGregor, and the plan has been sanctioned by Government ; the working-plan report for parts of the same comprising two series has

now been submitted to the Conservator; and parts of Ankola and Yellapur ranges have been taken in hand by Mr. Bell.

4. The Kanara Working-Plan has cost thirteen annas and six pies, whilst the Colaba plan has cost 2·6 annas per acre.

5. Mr. Fry's plan for the Karjat and Khalapur ranges, when they were parts of the Thana District in the Northern Circle, was prepared under the supervision of the Honourable Mr. Shuttleworth, and it has been fully described in the Forest Administration Report for 1893-94.

6. Mr. Mitra's plan for Panvel, Pen, Nagotna and Alibag—called Central Colaba—is based on a "combined method" under "Clean-felling." Each of the forest ranges has been treated separately. The entire forest area, excluding pasture, is first divided into the following classes:—

(*a*) Teak forests—forests to be worked principally for teak, any fuel found in them being exploited at the same time;

(*b*) Fuel forests—forests to be worked principally for fuel, any timber found in them being exploited at the same time; and

(*c*) Special forests—forests such as fodder reserves, plantations, forests with no tree-growth and the like, which require special treatment.

7. The Colaba forests are principally pure teak coppice forests of an average diameter of 8 inches at breast height over bark; the height of the forest seldom exceeds 25 feet. They are being worked for rafters for these 15 years, and there is a record of the number of teak trees removed from them from year to year. The cutting list has been obtained from the Divisional office, and compared and corrected on the spot. The teak forests in each range have again been divided into:—

(*a*) Uncut forests—forests which have not been exploited for the last 15 or 20 years, and which contain mature exploitable teak ready to be cut immediately;

(*b*) Partly cut forests—forests in which a part or parts only have been exploited under the selection or clean-felling system within the last 15 or 20 years, and which will contain mature exploitable teak unmixed with young coppice, which can be exploited immediately; and

(*c*) Fully cut forests—forests which have been fully exploited within the last 15 or 20 years either under selection or clean-felling and no part of which can be exploited at present.

8. The teak trees, seedlings and coppice, of various size and age, have been classed under the following three heads:—

(*a*) Mature exploitable trees. These are seedling trees

or coppice stems of and above 4 inches in diameter at breast height over bark, whose age is more than thirty years;

(*b*) Coppice approaching maturity. These are seedling trees or coppice stems whose age is less than 30 years and more than 10 years, without reference to size;

(*c*) Immature coppice. These are seedlings or coppice stems whose age is less than 10 years, irrespective of size.

9. The mature exploitable trees in block * or blocks in uncut and partly cut forests, have all been counted; mature exploitable trees in old coupes have also been estimated or counted in each forest. When there is more than one stem on a stump, each one has been counted separately. Immature coppice stems and trees approaching maturity have been calculated from the cutting list compared and corrected on the spot, each old stump being considered to have produced one stem. From the wholesale counting of mature exploitable teak and from the cutting list thus compared and corrected, the total teak, *viz.*, mature exploitable teak in block or blocks, mature teak in old cuttings, coppice stems approaching maturity and immature coppice stems in each forest has been calculated separately, and thence the total number of teak in the teak forests in each range has been arrived at.

10. The area of each forest is known from the forest register kept in the Divisional Office at the time of forest settlement.

11. It has been determined by counting the ages of a large number of felled teak trees that the trees (coppice stems) continue to grow well up to 30 years, after which the growth is indifferent. Thirty years was originally fixed upon as the period of the rotation, but Government have decided that 40 years is to be the rotation. Government have also ruled that standards should be kept.

12. On the "simple area system" the annual yield would have been extremely varying, and the volume could not, in these forests, have been determined mathematically, accurately enough to exploit them under the "volumetric system." It is therefore proposed to work these forests under the "combined method" of volume and area. It is proposed to exploit about $\frac{1}{40}$th of the total teak every year irrespective of the area, which will necessarily vary with the density, with the condition that in every 5 years $\frac{5}{40}$ or $\frac{1}{8}$ of the teak area is not on any account to be exceeded. The present plan covers a period of 10 years only. Every year in each range there are various centres of cutting and they have

* "Teak in block" or "teak in blocks" means trees of practically equal ages growing *en masse* and unmixed with other age classes.

been so arranged that in every year there are a few "whole-area centres" of cutting and a few "part" or "remaining-area centres of cutting. In "whole-area centres" and "remaining-area centres" of cutting the whole or remaining area is to be exploited irrespective of the number of trees entered against them. In "part-area" centres the number of trees prescribed should, on no account, be exceeded; the area entered against them is an approximate one and is calculated from the density of the teak in each forest. The average density of teak in each forest has been determined by dividing the total number of teak by the area. This latter includes blanks and *dalhi* land. This acts as an automatic check on enumeration and any error in it is distributed over 5 years instead of accumulating in the 5th year. When a forest or a part of it has been exploited, the blanks in it should be planted up and the forests rigidly closed for 10 years.

13. Regeneration in these forests is dependent on coppice stems and seeds sown broadcast by the forest guards and on their effective closure.

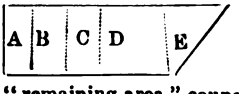
14. Every year the prescribed number of trees in the part-area coupes are to be accurately counted, and the stunted and gnarled trees should also be included;* a line 10 feet broad is to be cut round the proposed felling. In the whole or remaining-area coupes nothing need be done. These coupes are sold annually to the highest bidder, who agrees to buy them at the fixed rate per 100 standing trees, marked for felling, and at a fixed rate per 100 cubic feet of fuel found in them, and exploits the contents in accordance with his contract agreement. *Rais* (evergreens), *edible fruit trees* (mango, jack, &c.), *hirda* (myrobolams) and madipalms (toddy palms) are not marked for felling.

15. Fuel forests in each range are divided into 30 coupes of equal area and are shown on the maps. Five such coupes in each range have been marked on the ground; one coupe in each range is sold annually to the highest bidder.

16. The special work to be done in forests requiring special treatment has also been prescribed in the plan.

17. A working plan for Southern Colaba, comprising Roha, Maha and Mangaon ranges, prepared by Mr. E. G. Oliver is on the same lines as the Central Colaba plan of Mr. Mitra.

Note.—Whole area centres of cutting are the coupes which consist of the entire forest number or an isolated bit, the whole of which is exploited in 1 year.



Part or remaining centres of cutting are the coupes which consist of part of the area of the entire isolated forest bit or number. For example, if A, B, C and D have been exploited in former years, then E is a "remaining-area" coupe. If only A or A and B have been cut, then C is a "part-area" coupe; and if whole or A B C D E is intended to be exploited in one year, then it is a "whole area" coupe.

* Of the promising trees a sufficient number of standards not less than 10 or more than 30 per acre are to be reserved when available.

18. Mr. Bell's plan for part of the Supa and Haliyal ranges sanctioned by Government, is based on "selection felling." The teak-bearing area of these two ranges, the timber from which is brought to the Haliyal Depôt, has been divided into 9 series, each series is again divided into 18 to 36 compartments which are approximately of equal area but are not of equal capacity. Series and compartments have either natural boundaries such as rivers, nallas, &c., or artificial boundaries, such as footpaths, cart-tracks, made roads, cultivation, &c., or boundaries of 20 feet broad cut lines. They have been shown on the forest topographical maps of 4 inches equal to a mile and also marked on the ground by zinc plates with series and compartments marked on them, fixed on trees.

19. In each compartment 6 to 8 per cent. of the area has been estimated by long test-plots 200 feet wide running right through the compartment. In estimating these test areas, all trees of and above one inch in diamater have been measured in one inch classes. Teak (*Tectona grandis*), blackwood (*Dalbergia latifolia*), matti (*Terminalia tomentosa*), nana (*Lagerstræmia parviflora*), jamba (*Xylia dolabriformis*) and kindal (*Terminalia paniculata*) have been noted separately—and all other species have been included in the jungle-wood class. From this test area enumeration the total number of trees has been calculated for each compartment in 4-inch classes, and hence for the whole series. Each series has been estimated separately. Of the various species found in these forests teak commands the greatest demand, and is sold at Re. 1-8 per cubic foot; blackwood, (*Dalbergia latifolia*), matti (*Terminalia tomentosa*), heddi (*Adina cordifolia*), &c., are plentiful and the supply far exceeds the demand. The plan is therefore made principally for teak; any other useful species found in the coupes may also be exploited along with teak if there should be any demand for it.

20. Of the 4-inch classes, Mr. Bell calls all teak trees above 24 inches in diameter at breast height over bark *the ultimate class*, or *mature* trees, and he proposes to exploit them only. All trees from 21 to 24 inches diameter are called the *penultimate class* and those from 17 to 20 inches are called the *ante-penultimate class* trees. Trees below 17 inches in diameter are called *lower class* trees.

21. Since the commencement of estimation in 1888 till the preparation of the plan in 1895, trees in various compartments have been exploited under the old "Working Scheme" system, at the same time trees from the penultimate class have entered the ultimate class for which Mr. Bell makes additions and subtractions to and from the estimated number of trees in each compartment. He also subtracts $\frac{1}{12}$ th of the trees in the penultimate class for suppression, and a deduction has also been made in a few special

compartments in this class for the paucity of trees in the lower classes. Thus the number of trees in the ultimate and penultimate classes is calculated for each compartment, and hence for the whole series.

22. It has been determined that teak trees above 24 inches in diameter at breast height over bark have the maximum of utility and they take 180 years to arrive at this diameter. It has also been determined that trees in the penultimate class require on the average 32 years to reach the ultimate or mature class. To this number 4 years has been added for safety and 36 years has been taken as the time required for it.

23. The plan is prepared for a period of 24 years only, which is $\frac{2}{3}$rds of 36, the number of years required for the next higher class to reach the highest, ultimate or mature class. Mr. Bell therefore proposed to exploit $\frac{2}{3}$rds of the trees in the penultimate class, the other half he proposed to reserve for the second period of 24 years. Government, in sanctioning the plan provisionally, have ordered that the whole of the trees in the mature class are to be exploited instead of the half. In the plan therefore $\frac{2}{3}$rds of the trees in the penultimate class, after additions and deductions, called A' and the whole of the mature trees called M,' are proposed to be exploited in 24 years.

24. The whole of A′ or $\frac{2}{3}$rds of trees in the penultimate class would mature in 24 years. In the first year $\frac{1}{24}$ths of A′ will mature, in the second year $\frac{2}{24}$ths of A′ and in the third year $\frac{3}{24}$th of A' and in the twenty-fourth $\frac{24}{24}$ ths or whole of them would mature. The whole of the teak area in 9 series is divided into 24 blocks, consisting of a varying number of compartments which are contiguous forming as compact a block as possible. These blocks are not of equal area, but they have been found to be of equal productive capacity. It is proposed to exploit annually one of these blocks, under the selection system, the number of trees prescribed should not be exceeded, but if the estimated number is not found in the area trees must not be taken from other blocks to make up the number.

25. In the first year's block or coupe $\frac{0}{24}$ of the A′ of the coupe (A′ being here the penultimate class trees existing in the block) will mature at the beginning of the year, so the yield for the first year would be $\frac{0}{24}$ M′ only. No part of A′ being available for exploiting but $\frac{24}{24}$ A′ will remain uncut in this year's coupe which will come over from the penultimate class, after the coupe has been exploited and it is again exploited after 24 years. In the second year's coupe $\frac{1}{24}$ A′ will be mature at

the beginning of the year, these together with a sufficient number of M′ to make up the annual number to be exploited will therefore be the yield and $\frac{23}{24}$ A′ will be mature at the end of 24 years from the first year of the period of 24 years in this year's coupe. In the third year's coupe $\frac{2}{24}$ A′ will mature; these together with a sufficient number of M′ to make up the annual yield will be the yield and $\frac{22}{24}$ A′ will remain unused during the period, and so on. In the 24th year's coupe $\frac{23}{24}$ A′ will mature; these together with the requisite M′ to make up the annual yield will be the yield, and $\frac{1}{24}$ A′ will remain unused. The blocks have been formed to give as constant a yield as possible year by year. The amount of A′ which will not be available for cutting is:—

$$\frac{1}{24} \times \frac{1}{24} A' + \frac{1}{24} \times \frac{23}{24} A' + \frac{1}{24} \times \frac{22}{24} A' + \ \ldots \ \frac{1}{24} + \frac{1}{24} A'.$$

$$= \frac{1}{24} \times \frac{1}{24} A' \left\{ 24+23+22+ \ \ldots \ 1 \right\}$$

$$= \frac{1}{24} \times \frac{1}{24} A' \left\{ \frac{24}{2} \ (24+1) = 12 \times 25 = 300 \right\}$$

$$= \frac{1}{576} \times 300 A' = \frac{300}{576} A'.$$

The portion of A′ which can be utilized is therefore $\frac{276}{576}$ A′ the annual yield therefore is $\frac{1}{24}\left(\frac{276}{576} A' + M'\right)$. In prescribing the annual yield whole compartments have been prescribed for. If they have a few trees more or less in number than the mature trees required to be exploited annually, they are subtracted from or added to the next year's yield.

16. Mr. Bell has proposed that the trees be girdled to death two years before they are felled. Compartments are to be closed rigidly for 10 years after exploitation. Regeneration is dependent on self-sown seeds, supplemented by seeds sown broadcast by the forest guards.

17. Mr. Bell's plan for the Kalinadi or Gund series is identical with the one described above.

18. In each of the three circles of the Presidency proper, Northern, Central and Southern Circles, excluding Sindh, there is an officer usually a Deputy Conservator of Forests who is in charge of the Working-Plans Division. In the Southern Circle there are two parties under one Divisional Officer at present (as two are not available), under whom there are two Extra Assistant Conservators, four Surveyors and four Foresters mostly trained men from Poona College of Science either in the Engineering or Forest Branch.

"ORGANIZATION."

Too much fire-protection in Burma.

No. 1.

I have read H. S.'s remarks in his article "Too much fire-protection in Burma" with the greatest interest and pleasure. Having worked in the same Division as H. S. and now as District Officer of a Division in Burma in which there is a good deal of fire-protection attempted, the remarks were of special interest to me.

From beginning to end, with the exception of the clause about statistics, to which the Honorary Editor has objected, I am in accord with the writer. I have tried the figures given in some of our Burma working-plans of the number of teak trees below three feet in girth, dominant and suppressed, in and adjoining fire-protected areas. They are quite useless for argument. They might be used on either side. The fact is that countings, &c., are only made of a small proportion of the crop, not one-third; the growing stock being deduced from these countings. To be of any use, accurate countings of all seedlings of teak on fairly large well-defined areas within and in similar forests adjoining the fire-traced areas would have to be made from time to time.

Everywhere I notice that the number of young plants of teak (and of cutch, too) are very much more plentiful in the forests which are every year burnt over than they are in the fire-traced areas; the only exception is that of patches where the bamboo has flowered. The reason of this is clear enough: light is necessary for a young teak to flourish and the burning of all grass and *débris* by the yearly fires supplies this want. These fires occurring annually, they are not very fierce, so that the young teak plants do not get destroyed outright, and when once they get their crowns free they go ahead; fire-protection is then beneficial. Want of light is a worse enemy to a young teak seedling than the ordinary jungle fire. A young seedling, after it has once germinated, would, under ordinary circumstances, in a protected area, go struggling on from year to year until such a time as the bamboo flowered or external help were given.

When there are plantations, however, fire-protection must of necessity be resorted to and continued for a certain period. The question is, how long is the fire-protection to be maintained?

In the Burma working-plans it has been shown that a teak tree takes 150 to 180 years to attain marketable dimensions. This is in natural forests. Perhaps, in plantations, with fire-protection at first and with the aid of weedings and thinnings, 120 years would suffice. Are we to go on fire-protecting for 120 years? Would not doing so bring in a very poor return on the money expended? What I think necessary is, that the plantations should be protected from fire until the young trees are about two feet in girth at breast height, and the plantation has received its first thinning. On a teak tree of this size fire has no effect, unless there is an enormous amount of dead dry wood surrounding the tree.

A girth of two feet is reached in about 15 years. My idea is that if the plantations were protected from fire for 20 years (20 years is taken so as to be well on the safe side), it would be sufficient. In the 21st year, *i. e.*, the first year that fire-protection has been discontinued, it would probably be advantageous to set fire to the leaves, &c., early in February. This would lessen the danger should fire come in later on, as it most certainly would, as much of the inflammable matter would have been burnt.

H. S. mentions humus incidentally ; I agree with what he says, but would like to state that I have during the present year been carefully looking out for humus in those areas which have been fire-protected for the longest time, and that most successfully. Not once have I found humus ; earth-worms, white-ants, &c., seem to eat up all the leaves and work them into the soil.

The plan for fire-protecting the whole of the Pegu-Yoma reserves *en masse* is on paper undoubtedly a very pretty one, but where is the labour to come from ? roads and tracks crossing the Yoma from the Irrawaddy to the Sittang Valley would all have to be traced. Should a fire start or be started near the main range, when would it be found out ? and how would it be put out if detected ? There are no villages near. Often the nearest village would be 20 to 30 or more miles away, and before help could arrive and the fire be put out, thousands of acres would most certainly be burnt. The ante-penultimate para. of H. S. is all to the point.

F. J. B.

No. 2.

H. S.'s article in the May number of the *Indian Forester* has no doubt given many readers of the *Indian Forester* food for thought, and it will be interesting to hear what our colleagues in Lower Burma think of his ideas on the question of protection from fire there. It has not yet been my fate to serve in Lower Burma, but I have some knowledge of the Upper Burma teak forests, as well as of teak forests in India, and I imagine teak forests are much the same wherever they grow, though perhaps the reproduction of teak is better in Lower Burma and the growth of young teak faster than in India. It is, however, reasonable to assume that the effects of an ordinary jungle fire are of a similar nature in any teak forest. Now I must say that my observations lead me to differ from H. S.'s conclusions as to those effects. He says : (*a*) that thanks to its hard exterior, the teak seed is only charred and blackened on the outside, but its vitality is in no way impaired by the fire. My experience is that the seed is often burnt up altogether and even when not burnt up its vitality is often impaired. I have frequently cut open scorched teak seed and found the kernel shrivelled up and useless. (*b*) H. S. admits the evil effects of fire on young plants, but I am not so sure that he is right in regard to the *yearly increasing* vigour of the root shoots. This may be true for the first year or two, but constant burning down tends to injure the

bottom of the stem and induce disease which gradually impairs the vitality of the shoots. What really happens is that the shoots get burnt down till some year when it accidentally escapes fire or the fire is too light to hurt it, the shoot then escapes damage and by next year may be high enough to be out of harm's reach with extra layers of bark to protect its lower stem. I quite concur with the 'general belief' noted by H. S. that the damage done by fire to the underground stem of young plants is responsible for much of the hollow timber we find in our forests. This in itself is a weighty argument in favour of protection from fire. (*c*) H. S. says "on the teak tree with its protecting 'outside layer of corky bark the fire has absolutely no effect." This may be so in Lower Burma, but I 'hae my doots.' It is certainly not so in any forests that I have seen. Teak trees are, as a matter of fact, often badly injured by jungle fires, a heap of *débris* of dead bamboos and such like gets collected at the base of a tree and makes an enormous fire scorching the bark right through and killing it. Sometimes the tree is killed outright, in other cases a large piece of dead bark falls off leaving the wood unprotected to become gradually eaten into by future fires, the weather and insects. (*d*) Does all other vegetation suffer more severely than teak as H. S. asserts? I should certainly say not. It all gets equally burnt down, but does it not spring up again quite as fast, if not faster than, his lordship the teak plant? Take, for instance, the *Terminalias*, *tomentosa* especially and the *Grewias* and the *Lagerstrœmias* and just think how they go ahead hand over fist after a jungle fire! I think it would be safe to lay odds against the teak in its race with these others. Again, take the *kaing* grass and we shall, I fear, find our teak plant again badly worsted.

No doubt, germination is aided by the burning away of brushwood, provided the canopy is sufficiently open, but we do not want annual fires for germination.

On the whole, then, though I admit that H. S.'s conclusions are nice and comfortable, I cannot see that annual fires can ever be anything but prejudicial to teak forests, and I believe it is sound policy to extend protection as far as funds and administrative considerations allow.

F. B. D.

No. 3.

In his article in the *Indian Forester* for May last, H. S. assumes that the forests of Burma having been annually burnt ever since time immemorial, the teak tree has gradually adapted itself to the situation, and now thrives better under the stimulus of fire than without it.

It must be admitted that teak does withstand fire better than many other trees, but there seems no reason to suppose that this is the result of adaptation, for other trees have been exposed to precisely the same influences and have not developed means of resisting the effects of fire.

Forest fires have probably taken place from time to time ever since Burma has been inhabited, but it by no means follows that they have always been of annual occurrence. Even now in the more sparsely populated districts the whole forest is not burnt through every year ; a portion nearly always escapes, sometimes more and sometimes less, according to local circumstances ; it is therefore only reasonable to conclude that in days gone by when the population was very much smaller than now, the proportion of forest annually burnt was much less.

H. S. altogether ignores the effect of annual fires in causing erosion and the consequent deterioration of soil and vegetable growth. On fairly level ground, covered with forest of a moist type with little undergrowth, annual fires possibly do not do much harm to teak trees when once the latter have reached the sapling stage, but in dry forests and especially on sloping ground the ill effects are very apparent. In such conditions, the soil deprived of its protecting cover is every year washed away to a very appreciable extent, which is shown by the fact that stones, logs and even small sticks scattered about in the forest do not rest on the general level of the ground but are supported on pinnacles of earth often several inches high, which have been caused by the washing away of the surrounding soil.

The teak tree loses its tap root at a comparatively early stage in its existence, and the exposure by erosion of the lateral roots causes an abnormal development of buttresses with resulting unshapely stems.

This has been repeatedly observed in comparing sections of trees from plantations which have been regularly burnt with those from protected areas. In these buttresses dead leaves and other inflammable materials accumulate, and the fire when it comes is fiercer than the bark of the tree is able to stand. An examination of almost any forest in Burma will show that on the slopes and ridges there is hardly a single tree of 4 feet girth and upwards which has not at its base one or more inverted V-shaped patches on which the bark and sapwood have been entirely killed. In extreme cases, the fire eventually gets right under the tree and it is not at all uncommon to find an old tree standing raised on its side roots so that one can see right underneath it.

Although, at first sight, it may seem improbable, it is my opinion that annual fires are in a great measure the cause of the encroachment of evergreens in deciduous forests. Under ordinary circumstances the fire regularly stops at the edge of the evergreen patches, and the deciduous forest being cut back, while the evergreen remain unchecked in growth, the tendency is for the latter to spread at the expense of the former.

In connection with this I may mention that I recently came across a patch of forest which consisted of a number of old teak and other deciduous trees standing rather far apart with a light

undergrowth of grass, climbers and evergreen seedlings. All the trees had their bark charred and blackened by fire to a height of about 40 feet. A Burman who was present explained this by saying that the patch had been formerly occupied by an undergrowth of bamboos which had flowered and died a few years previously. At the time of my visit there was not a trace of a bamboo to be seen. The young plants had probably been destroyed by the intensity of the fire and their place subsequently taken by seedlings from a neighbouring belt of evergreen forest. A few years hence this patch will probably be a dense evergreen jungle with a few teak trees scattered through it.

It is a generally accepted fact that in forests of a moist type continued fire-protection is antagonistic to the reproduction of teak, and that a judicious use of fire is under certain circumstances fully justifiable ; but having once secured reproduction it may be taken as a general rule that the less the forest is burnt the better it is for the teak.

In conclusion, I would point out that the theory put forward by H. S. that the teak tree prefers a soil devoid of humus is opposed to the fact that the best teak is generally found on well drained alluvial flats on the banks of streams where the soil is entirely composed of fine earth mixed with vegetable remains washed down from higher ground.

J. W. OLIVER.

II. CORRESPONDENCE.

Planting of Bucklandia among Tea.

Dear Sir,

Will you be so good as to inform me through your columns as to the suitability of planting the *Bucklandia* tree for shade, timber and firewood on a Ceylon tea estate, elevation about 3,000 feet, in a dry climate, that is to say, planted in the tea at intervals and along the roads, also for timber clearing alone, on the estate. Also as to the planting out of the seed in nurseries : whether it requires any special soil or preparation of the soil for rearing plants in the nurseries.

I have never seen the seed, so have no idea what quantity (weight) to order to raise say, 10,000 plants. Can you inform me?

Will you also kindly insert advertisement—

Wanted—*Bucklandia* seed, suitably packed, for transmission to Ceylon. State price for large and small quantity.

Some trees have a marked injurious effect on the tea, whereas *Grevillea rolusta* does no injury but rather the reverse.

I should like to know what you think would be the effect on tea if interplanted with *Bucklandia*.

ROTHSCHILD ;
PUSSELLAWA,
CEYLON. } W. H. HANNAM.

Note.—Perhaps some of our Darjeeling subscribers could kindly forward the required information. The *Bucklandia* seed, so far as we know it, is very small. We think it would have much too heavy a foliage and be too shady for planting in tea.—HON. ED.

Counting "Yas" in Burma.

The letter of F. J. Branthwaite is so interesting and so eminently practical, that it is a pity he did not remember that we do not all understand Burmese. A 'Ya' is apparently either a young plant or a planted area, in a sense generic or specific? Would the writer of the article, or you Mr. Editor to save time, kindly give an explanation of the term "Ya," and other correspondents also take the hint as to using vernacular terms.

F. GLEADOW.

Flowering of Strobilanthes in Bombay.

Strobilanthes callosis flowered along the Western Ghauts in the Belgaum District in 1887 and in 1895, showing an interval of 8 years. The flowers appear in the month of August but the seeds do not ripen till the following May.

Strobilanthes sessilis is very common along the Western Ghauts at an altitude of about 2,800 ft., and flowered in 1888 and in 1895, showing an interval of 7 years.

HUGH MURRAY.

III. OFFICIAL PAPERS & INTELLIGENCE

Notes on Forest Operations.

In our number for March 1895 (Vol. XXI, p. 101) we published a Circular on this subject from the Inspector-General of Forests.

We have now received from him copy of his Circular No. 1 of 6th January 1896, which is the outcome of the opinions obtained from the different Conservators and duly considered; and he asks us to explain that "what is required in the matter is a 'journal, a ledger in which would be entered methods of working,

'&c., based upon the experience gained in past years in connection 'with forest management, new proposals and schemes finding 'their place elsewhere."

We hope the Inspector-General of Forests will not mind our again expressing the hope that old contributors to this Journal will not consider it necessary to cease their contributions and their support to the Magazine.

"Replies having been received to the Circular from this 'Office, No. 2, dated 31st January 1895, generally approving 'of the arrangement sketched in paragraph 4 for the record of 'notes on forest operations, I have the honour of inviting you 'co-operation and that of the officers serving under you in the 'compilation and editing of notes on the lines already indicated."

"2. It has been suggested that the following subjects should 'be included amongst those enumerated in paragraph 4 of that 'Circular :—

'Injuries done by insects, fungi, etc.,
'Rates paid for forest work,
'Miscellaneous ;

'and to these or any other further additions that circumstances 'may render desirable there can be no objection.'

"3. A suggestion that each officer should be supplied with a 'note-book showing the headings, with a few blank pages after 'each, does not commend itself to me ; for the reasons that 'officers will, as a rule, confine their notes to a limited number 'of subjects, and that an invitation to write on all subjects is 'likely to lead to the omission to write on any.'

"4. Some officers have expressed the opinion that the notes 'could conveniently be published and discussed in the *Indian 'Forester;* but there seems to be doubt whether these notes, 'which relate more to local matters than to specific points or 'subjects of general interest, would be generally read in a 'magazine, and I am disposed to think that the publication of 'such papers as are suitable for discussion in the *Forester* is 'quite apart from the preparation and printing of notes on local 'customs and works.

Amount of Charcoal required in the production of Iron.

Extract from a short Report drawn up from information kindly supplied by the "Oesterreichische Alpine Montan Gesellschaft," a company which owns and works nearly all the mines in Styria and Carinthia.

Question 5.—How much charcoal is used per ton of pig-iron produced ?

Answer.—The output of the smaller furnaces varies for white pig-iron, from 24 to 32 tons per 24 hours. The large furnace (No. 3) in Vardernberg produces 60 to 65 tons in the same time. The consumption of fuel is 70 to 80 per cent. of the output for white pig-iron. Grey Bessemer, or foundry pig-iron, cannot be made under 0·9 to 1·0 ton of charcoal per ton of pig-iron. The output of these sorts is about 20 per cent. smaller than in making white pig-iron.

Question 6.—What kind of wood is generally used, and how many tons of wood are required to produce 1 ton of charcoal?

Answer.—The woods employed for making charcoal are mostly fir (*Pinus Abies*) or beech. The consumption is about 4 tons of wood per ton of charcoal

All the charcoal is produced in open heaps (meilern) and not in kilns.

The charcoal from kilns is not so good, and is more expensive, as the wood must be brought to the kilns, whereas the "meilern" can be established wherever the wood is cut.

The charcoal is brought to the neighbourhood of the mine, *i. e.*, to the ore, and not *vice versâ*. The so-called "soft charcoal" (made from soft wood) is mostly obtained in the vicinity of the iron-works, or at a distance not greater than from 40 to 50 miles; whereas the hard charcoal (made from beechwood) is sometimes brought from 100 to 200 miles to the blast furnace.

Note.—This extract came to us from the Inspector-General of Forests, who thinks that the reference to the comparative values of charcoal made in meilern and in kilns is important as coming from an authority on practical mining, *not* a Forester.—HON. ED.

Turpentines of Pinus Khasya and Pinus Merkusii.

We have received the following letter and enclosure from the Reporter on Economic Products:—

"As requested by the Government of India, Revenue and 'Agricultural Department, I have the honour to forward herewith 'a printed copy of letter No. 3—49-69 (F. S. S. No. 78), dated '28th February 1896, being a preliminary report on Turpentines 'from *Pinus Khasya* and *Pinus Merkusii* furnished to this Office 'by the Secretary and Director, Imperial Institute, London."

"Professor Armstrong, a Member of the Committee of 'Advice of our Research Department, has just furnished me with 'a preliminary report on Turpentines from *Pinus Khasya* and *Pinus* '*Merkusii*, of which supplies were furnished to him some time 'ago; and I have the pleasure of communicating, for the informa-'tion of the Government of India, the following interesting results 'of his examinations."

"The crude turpentine from *Pinus Khasya*, which was a grey 'thick, pasty mass, containing a quantity of small pieces of wood, 'furnished by distillation with steam about 13/100 of its weight 'of oil ; while the product from *Pinus Merkusii*, which was more 'fluid and clearer in appearance than the other, yielded nearly '19/100 of oil by corresponding treatment."

"On a former occasion Professor Armstrong obtained from a 'sample of *Pinus Khasya* 17 per cent. of oil, and he believes, there-'fore, that the particular sample now operated upon was collected 'under less favourable conditions, and that some of the oil had been 'lost by evaporation before the supply reached him."

"The original turpentine and the distilled oil in each case have 'a very slight but agreeable odour, less pronounced in character 'than that of French turpentine, but distinctly characteristic. In 'this respect the oils from the two turpentines were very similar. 'Professor Armstrong has satisfied himself of the identity of the 'oil from *Pinus Khasya* with that which he examined several years 'ago, and which is referred to in pages 20 and 21 of Hand-book 'No. 7."

"Considerable difficulties attend the determination of the pre-'cise chemical composition of oils of this class, and methods with 'this object in view are, at the present time, in course of elabora-'tion. Such experiments as Professor Armstrong has been able 'to make, have satisfied him that the oil of *Pinus Khasya* is strictly 'comparable with French oil of turpentine. This conclusion 'corresponds with that which he arrived at several years ago, as 'stated in the Hand-book. In this respect the oil from *Pinus* '*Merkusii* closely resembles that of *Pinus Khasya*."

"Both oils distil within a very narrow range of temperature, 'near to 155°C., as does the furnished oil of turpentine ; but the 'oil from *Pinus Khasya* appears to contain a somewhat larger pro-'portion than the others of a constituent of higher boiling 'point."

"The two oils are very nearly alike in relative density, *viz* :—

	P. Khasya.	*P. Merkusii.*
'At 20°C.	·8627	·8610

'They both turn the ray of polarised light to the right, the so-'called specific rotatory power being—

P. Khasya.	*P. Merkusii*
'36″·28	31″·45"

A similar result was furnished by the oil from the sample of *Pinus Khasya* formerly examined. The rotatory power of French turpentine is practically always about 36.°

The difference between the oils from the two Burmese turpentines is not of a kind to be of any practical importance. They are essentially similar, the slight difference between them being due to the presence in one or other of a small quantity of some substance in addition to the chief constituent. Practically they correspond exactly in properties to French oil of turpentine. Pro-

fessor Armstrong is disposed to think that the oil of *Pinus Merkusii* may be more uniform than that from the other turpentine. He proposes to continue his experiments with these products for the purpose of endeavouring to determine their precise composition. Meanwhile, he states that both oils are of the highest quality, and that, in his opinion, they will be found to serve every purpose for which oil of turpentine (French or American) is used. They compare favourably even with the French oil, which is the highest quality in the market.

The resin or colophony which is left after distilling off the oil from the two samples is of good quality, and would be available for all purposes for which ordinary resin is used.

There appears to be no reason why India should not obtain whatever turpentine is required in the country from native sources. Professor Armstrong hopes, later on, to furnish a more detailed report in regard to the composition of the oils obtained from these two turpentines.

F. A. ABEL,
Secretary and Director,
Imperial Institute, London.

Deterioration of Indiarubber by keeping.

We are asked to publish the following copy of a letter dated the 11th May 1896, from the Reporter on Economic Products to the Government of India, to the Inspector-General of Forests, Simla:—

"Replying to your demi-official dated 24th ultimo, on the subject of the Assam rubbers, I am glad to find that you underestimated them. That gives a better token of the future, than if you had gone to the other side. As to the want of uniformity in Carritt and Co.'s valuation, so much depends in the eyes of brokers on external characters, that the sample that had got a little more exidised through more direct exposure to air than another would at once get a lower price assigned to it. It is wonderful how rapidly indiarubber in its crude state suffers. Some of our samples in the Museum have become liquids, devoid of all elasticity. This, I think, should give the practical suggestion that the sooner rubber leaves the producer's hands and is taken over by the purchaser the better. No consignments should be delayed in India."

"But besides oxidization there are many other ways by which one parcel drawn from identical trees and prepared by the self-same process will fetch a lower price. But I think the Assam Conservator told us that the samples were obtained from several recognized races of the rubber tree. So that there may be a botanical reason for the variation in the valuation, I am promised botanical samples of each form, and will, I hope, soon be in a position to express an opinion upon this feature. I hope Assam may be able to furnish us with larger samples. We could easily find willing buyers, as there is a distinct demand for Assam rubber."

IV.—REVIEWS.

Economical designing of Timber Trestle Bridges.

Bulletin No. 12, * by A.L. Johnson, C. E., contains, besides the paper by Mr. Johnson, a Review of the paper by Mr. G. Lindenthal, Chief Engineer of the North River Bridge Company, Notes by Mr. Walter G. Berg, principal Assistant Engineer of the Lehigh Valley Railroad; as well as a Report of the American International Association of Railway Superintendents of Bridge and Trestle Timbers. The Bulletin deals with trestle bridges contructed to carry railways, and points out that, as at present constructed, some parts of the structures are much too weak and others unnecessarily strong. The paper also discusses their general design.

Some interesting information is given as regards the modulus of strength at rupture, modulus of elasticity, elastic resilience, crushing strength across the grain, tensile strength and shearing strength of some of the more generally used timbers of the United States, and the addition of halt an inch to each dimension, theoretically determined, to allow for weathering is advocated.

The immense difference in strength of green (freshly cut) and seasoned timbers, which is clearly shown by the experiments made by the division of Forestry is well exemplified by the following tabular statement concerning the four Southern pines.

	Moisture condition per cent.	Cuban pine.	Pinus palustris (Long leaf).	Loblolly.	Pinus echinata (Short leaf).	Average change
Transverse strength or modulus or rupture green	33	6,150	6,200	5,830	5,230	..
Compression endwise green	33	4,150	3,660	3,430	3,360	..
Relative strength, as a mean of transverse and compression						
Green	33	100	100	100	100	100
Half dry	20	125	119	122	120	122
Yard dry	15	149	147	147	138	146
Room dry	10	182	194	187	165	182

Most of the experiments which have been made, in order to determine the strength of Indian timbers, have, I think, been made with seasoned wood, and with specimens of small size. The

* U. S. Department of Agriculture, Division of Forestry, Timber Physics Series. Bulletin No. 12, prepared under the direction of B. E. Fernow, Chief of Division of Forestry of Washington, 1896.

experiments made in America have proved conclusively that small size specimen tests give much larger average results than full size test pieces, owing to the greater freedom of small selected test pieces from blemishes and imperfections, and their being, as a rule, comparatively drier and better seasoned than full sized sticks. The exact increase in strength exhibited by the former, as shown by tests and by statements of different authorities in America, is from 10 to over 100 per cent.

Comparatively very little is known about the strength of Indian timbers, and reliable data are very difficult to obtain. Surely it is time that the Government should take up this important question and institute a thorough investigation into the qualities and strengths of Indian timbers, both green and seasoned. If this is done, it would be most advantageous to conduct the experiments on the same lines as those made in America or Europe in order to get truly comparable results.

The factors of safety for wood under different kinds of stresses adopted in America is given below and should prove most useful in determining the dimensions of the different parts of timber structures in India.

Tension with and across grain	10
Compression with grain	5
Compression across grain	4
Transverse rupture, extreme fibre stress	6
Transverse rupture, modulus of elasticity	2
Shearing with and across grain	4

The factors of strength adopted in the paper are fully and carefully explained in an appendix.

The illustrations of the different trestles, in use or recommended, are drawn to scale, as they should be, but the drawings themselves are not sufficiently explained to render them intelligible to any but professional men ; whereas the rest of the Bulletin can be easily followed by any one who takes an intelligent interest in the subject.

The Bulletin would be much more valuable to Foresters in different parts of the world if the botanical as well as local names of the timbers described were given. For example, the botanical equivalents of Cuban pine and Loblolly appear nowhere in the Bulletin.

C. G. R.

Annual Forest Administration Reports of Bengal, Assam and Ajmere for 1894-95.

The *Bengal* Report begins with recording the constitution of the forests of the Sonthal Parganas as Protected Forests. This we are very glad to see, but we do not quite see what advantage is gained by making them 'Protected' and not 'Reserved,'

for enquiry has to be made into rights in one case just as much as in the other, unless the very vaguely worded last clause of section 28 of the Act is adopted. This clause was, we believe, inserted in order to enable areas of forest land which required to be placed under some law to be so placed until time was found for the more detailed enquiry required for Reserved Forests. It would have been surely more satisfactory for the Sonthals themselves if their rights, or such rights as Government intend to give them, had been definitely recorded and the comparatively simple legal arrangements of Chapter II brought in instead of Chapter IV with its ill-defined rights and the complicated rules which have to be made to supplement the Act provisions.

The area of the Bengal forests at the end of the year was :—

	Sq. m.
Reserved	5,839
Protected	3,091
Unclassed... ...	4,034
Total ..	12,964

but there are also large areas in Chota Nagpore, of which the area is unknown and the newly added Sonthal forests are not included. In respect to working-plans, the Government of India have recorded their remarks as follows : —

"It would appear from the remarks contained in paragraph '5 of the Lieutenant-Governor's orders on the report, that Sir 'Charles Elliott was of opinion that the slowness of progress in the 'preparation of working-plans cannot properly be wholly ascribed 'to the insufficiency of the staff of officers. No doubt both the 'comparative weakness of the superior staff and the exceptional 'frequency of the transfers of controlling officers tended to delay 'the completion of the working schemes and to diminish the use-'fulness of those that had been completed. But the Inspector-'General of Forests has represented that the preparation of short 'simple plans for such valuable forest tracts as those of the Singh-'bhum and Jalpaiguri Districts should be a matter of no real 'difficulty, which might be accomplished without much delay."

It would seem that possibly the delay is due to the idea that working-plans are necessarily rather complicated affairs and require much detailed valuation work and considerable time. And no doubt, to a great extent, this view is borne out by the Code and by the circulars of Government and the Inspector-General, and we think it might be advisiable if the Government of India were to amplify the authority given in para. 87 of the Code so as to recommend more clearly 'short, simple plans,' and to indicate generally what steps may best be taken to ensure them.

If only detailed valuation surveys could be omitted, for instance, the preparation of working-plans for the sál forests of Jalpaiguri and Singhbhum, ought to be a very simple matter. To any one who knows the Jalpaiguri forests, a perusal of the following looks rather as if sledge-hammers were being used to crack filberts.

"Assistance has been given to Mr. Haines in the preparation of 'the working-plan for the Jalpaiguri Division by the appointment, 'in January last, of one of the new Assistants just out from home 'to the Division, and it is hoped that good progress in the plan 'for this Division will result. The collection of facts and statistics 'mentioned in the report for 1893-94 has been proceeded with, 'and the Assistant has been employed in the marking of coupes 'in stock valuations, but a good deal still remains to be done. The 'work of the year comprised :—

'(*a*) Valuation surveys aggregating 1,218 acres.
'(*b*) The marking of the above on the system of coppice 'with standards and the recording of results.
'(*c*) The preparation of stock maps.
'(*d*) The calculation of conversion factors.
'(*e*) The measuring of sample plots."

"Coppice under standard" is an unusual method for application to sál, but we should not be surprised to see it prove very successful, as, presumably, the outturn of poles and fuel is required for the Duars tea estates and the coppice reproduction assisted by seed ought to make a dense forest growth and kill out the grass. But surely elaborate valuation surveys, and the calculation of conversion factors are not very necessary in a simple working-plan under coppice.

The Jalpaiguri forests contain 183 square miles, and if one year was spent over two only, it will take long before the plans for the whole are completed.

Fire-protection was very successful on the whole during the year, only ½ per cent of the area attempted having been burnt. The Conservator seems to have been much surprised at this success, and the Government of India consider that it was probably due to exceptional circumstances.

The remarks on *Natural Reproduction* are so interesting, that we do not apologize for making a long extract.

"In Darjeeling the results of the special measures dictated 'by the working-plan have been highly satisfactory. The year was a good one for seed, and oak seeds of last year have germi-'nated profusely in part of the cleared area in the coupe of '1894-95, where seed-bearers are found, and the seedlings thus 'obtained have been carefully protected by fencing and weeding. 'As the success of the regeneration fellings, under which method 'the Darjeeling forests are now being systematically treated, is 'so much dependent on natural reproduction, it is suggested that

'the remarks on this subject should, in future, be recorded by working circles.'

'Numerous seedlings of Maya (*Eriobotrya petiolata*), Arupati (*Prunus nepalensis*), Kaula (*Machilus odoratissima*), and Bûk (*Quercus lamellosa*) were observed on open places, the sites of charcoal kilns and on recent landslips, indicating that, where light and freedom from weeds exist, these species do not fail to introduce themselves. On a recent landslip, too, where the exposed surface was a mass of stones and boulders mixed with sandy and clayey soil, numbers of *Alnus nepalensis* have established themselves, while *Bucklandia*, birch, and *Pieris ovalifolia* have also been met with under similar conditions. In parts of the regeneration fellings, natural seedlings have shown a healthy development, but where the shade has been too low and heavy a good many have died or are stunted. In places the reproduction of champ (*Michelia excelsa*) is most striking and is of good growth, even under fairly dense cover. Natural seedlings of maple and laurels of two to six years of age are well distributed in blocks in course of regeneration in more open spots and where grazing is excluded. In the Singalila range, where not suppressed by the Maling bamboo, and except in areas where no parent trees exist, the reproduction of all species is good, while in the Tista Valley that of tûn and sál is the most noticeable, though seedlings of *Duabanga*, Saj, *Gmelina*, and other kinds of good timber trees have also been noticed.

'In Tista, as in Kurseong, the reproduction of sál in all stages is reported to be very good, while other species, such as champ and bûk are plentiful. The bamboo (*Dendrocalamus Hamiltonii*), which flowered and died off last year, is now again making its appearance, though, so far, in small numbers."

'In Jalpaiguri, most excellent sál has been met with in the coupes in Tondu and in Kyranti; and it is satisfactory to record that this species is pushing ahead in a partial savannah tract east of the Murti river, which has escaped burning for some six years, the tall grass having, to a great extent, given place to the shrub *Leea crispa* which usually betokens well-drained soil. It is also interesting to learn that, while in unworked portions of the forest only few trees seeded, the reverse happened in the coupes. Coppice reproduction of healthy sál not over 3 feet in girth is good, but where the locality is unfavourable, it, as well as seed protection, is poor."

'From Buxa, in opposition to the observations made in Jalpaiguri, it is reported that even where fire-protected, sál has made no progress in the savannahs; otherwise, reproduction is however, satisfactory, and specially so in the Paubari block, in Rydak reserve and in the Buxa range generally."

'In the Sundarbans, the sundri flowered profusely, and the seeding taking place in July and August, when the tides are

'at their highest, the seed is carried far and wide. In a forest of 'Keora, 30 feet high, on the Bangarah island, the ground was 'literally covered with sundri seedlings about 18 inches high, '77,000 having been counted to the acre. It will be carefully 'observed how this reproduction bears itself as the shade over-'head deepens."

'In Chittagong the most valuable tree of the district, the 'jarul (*Lagerstræmia Reginæ*) reproduces itself freely in parts of 'of Sitapahar, also the pitroy (*Amoora Rohituka*), the chakua '(*Albizzia stipulata*) and the tún (*Cedrela Toona*), while in 'Kassalong numerous seedlings of chandan (*Adenanthera pavonina*,) 'and nageswar (*Mesua ferrea*) have been observed. The repro-'duction of bamboo is said to be too vigorous and to have hind-'ered more valuable species in its abundance. The teak seeded 'profusely, and many natural plants have been noticed on the 'outskirts of the plantations."

The artificial plantation works seem to be somewhat desultory, but in Darjeeling they are among the chief features of the working-plan, and we reproduce the following :—

"*Darjeeling*.—This is an important branch of work in this 'Division, as the regeneration of the best species of trees in the 'upper hill forests is bound to be slow and uncertain. Accord-'ingly, it is a feature of the working-plan that natural repro-'duction shall be aided by planting to ensure a certain number 'of these species in the young growth, and operations to this end 'are, therefore, regulated by the prescriptions of the plan, which, 'as remarked in the previous year's report, provide for an area 'of 318 acres being undertaken annually at an estimated cost of 'some Rs. 7,000. The planting of this area, which represents 'the annual coupes, is shown under cultural operations, and, since 'the work of the year extended over 214 acres at a cost of Rs. '1,157, compared with 80 acres for Rs. 609 during the previous 'year, it is satisfactory to observe that not only has the cost per 'acre been considerably reduced, but also good progress has been 'made in bringing the work more into accord with the provisions 'of the working-plan. The preparation of additional nurseries to 'provide material for this purpose has also received much atten-'tion, judging from the expenditure incurred, which amounted to 'Rs. 1,560 as against Rs. 884 in 1893-94, though no area has been 'recorded. It is hoped that next year still further progress in 'this respect will be possible, and that, at no very distant date the 'area in arrears will all have been made good."

We read, under '*Experiments*' of attempts to introduce Deodar. It may perhaps be now forgotten that in 1874 to 1876 a considerable amount of pains were taken with Deodar, quite unsuccessfully. In our opinion, none of the North-West Himalayan conifers are likely to succeed in the Darjeeling forests unless possibly the silver fir, in high localities. Of exotic conifers,

Cryptomeria and Cypress do well enough. We do not quite understand the attempt to grow *Caryota urens* at Kalimpong and what it is to be for except for ornament. The pretty palm is common in the valleys of the lower hills up to, perhaps, 3,000 ft., but Kalimpong would be too high for it.

The following remarks on transport will be read with interest:—

"With the exception of a small delivery of some 52,000 'maunds of firewood to the troops at Jelapahar, which merely 'involves an expenditure of Rs. 2,360 annually, the whole of 'the extraction and transport of forest-produce are in the hands 'of purchasers, and consequently improvement in this respect 'is somewhat handicapped. Excepting in the Sundarbans and 'Chittagong Divisions, where carriage by water is the rule, the 'means of transport chiefly employed is the country-cart, and, 'although there is no doubt of its general usefulness, it must 'be acknowledged that it is not well suited to the work of hauling 'timber in the hills; in the plains and lower hills it answers fairly well 'in fair weather, but in the higher hills, where the cost of construc-'tion is enhanced, it requires expensively built roads, and it would be 'a distinct advantage in such localities if the pack-animal could be 'more largely employed. Mr. Manson advocates a flume, such as 'is used in California, in preference to a tramway for the hills, 'and, though no doubt this is an economical and inexpensive 'method of transport, its advantages over the existing method 'would require to be distinctly proved. But any means of 'transport is merely a question of calculation, and if it can be 'clearly shown that the adoption of some new method, no 'matter of what description, is remunerative, there is no reason 'why it should not be introduced."

We may suggest for consideration whether wire tramways are not likely to be much the best arrangement for the hills.

The Bengal Forest Department seems to suffer much from constant change of officers; and the death of two Deputy Conservators, Messrs. Davis and Richardson, during the year, is recorded.

The financial results of the year were :—

	Forest year.	*Financial year.*
	Rs.	Rs.
Receipts ...	... 8,25,669	7,95,673
Expenditure ...	... 4,09,552	3,97,601
Total Rs.	... 4,16,117	3,97,072

Practically therefore *half* the revenue is surplus. Surely a rich Government like Bengal could forego part of its share of the four lakhs in order to improve the staff, and enable it to make working-plans and carry out the many other works which are referred to as

necessary but deferred for want of staff.

The *Assam* Report shews the area of forest under the Department to be—

Reserved Forest ...	...	3,716	Sq. miles
Unclassed „ ...	...	13,912	„
Total	...	17,628	„

but there are still several areas under settlement and others the reservation of which is still being considered. The Goalpara working-plans are still being only partially carried out owing to (1) absence of trade, (2) objections of traders to the restriction of a prescribed plan, (3) inadvisability of accumulating departmental stock, while the Divisional Officer thinks the 'capability' in excess of the exploitable growing stock. In commenting on this, the Chief Commissioner doubts whether the time has yet come for the introduction of an elaborate and scientific system of fellings," and the Government of India remark:—

"Where the limited demand for the produce of the forests 'renders unnecessary the introduction of elaborate plans for their 'working, simple plans should nevertheless be prepared, so as to 'systematise such operations as are to be carried out. It is possi-'ble that the working-plan of the Goalpara *sál* forests is not alto-'gether suitable; but it seems unlikely that a working-plan which 'has been carefully prepared and scrutinised, should have material-'ly overstated the capabilities of the forests; and the statement to 'that effect recorded in paragraph 16 of the Conservator's report 'should not be accepted as superseding the results of the enumer-'ation surveys on which the working-plan was based without 'verification by further counting, if this is considered necessary."

In the Chapter on Breaches of Forest Law an interesting case of the law's delays is cited in which the accused was discharged *after* 21 *adjournments and* 7 *hearings*.

As usual, the remarks on *National Reproduction* are likely to be among the items of most interest to our readers, and we quote the following in consequence from the reports of the Goalpara, Sibsagar, Lakhimpur and Garo Hills Divisions.

"Mr. Campbell, in the Goálpara division, reports that the seed 'crop of sál has again been a failure: this is for the fourth time in 'succession. Inflorescence in the first instance gave promise of a 'bumper season, but the physical vagaries, referred to under fire-'protection, with hail-storms, did such serious damage as to arrest 'all further development, and make it partial and unequal. In fact, 'the process of assimilation seemed to have exhausted itself in revis-'ing the effects of the previous year's denudation and defoliation 'igns of which are still universally visible in dead twigs and, 'small branches. Fortunately the insect pest was only a feature 'of the year under report on a very small scale, the *Dasychira*

'*Thwaitesii* appearing in the Charaidaka, Hel, Kalasi and Saumukha 'blocks, scattered, and with an apparent lack of vitality. The areas 'invaded were margins of pure sál of medium size, very dry and 'with shallow and poor soil, and an *Aphis* attacked trees on the 'Haldibari road fire line, in the Pachadaveri block. April's rain 'freed the trees of these pests. Not 5 per cent. of the year's fruit 'matured and there is an almost utter absence of germination.

'The sál seedling crop, *i.e.*, the established crop of previous 'years, grew luxuriously and vigorously, and is secure against 'ordinary mishap. It is specially thriving in the coupes of previous 'years, where the canopy is open, but still sufficiently dense to 'keep the undergrowth thin. Grass lands on the margin of sâl 'forests are being most successfully invaded.

'Many of the larger trees have again been killed outright by 'the overflooding of the Champamati and Bhur rivers. Consider-'ing the area and purity of these forests the proportion of large 'timber is small, and it is somewhat doubtful whether its general 'character after the exploitable age is good. It is remarkable 'that sál in mixed forest is much finer than in pure, and the only 'big stumps in the district are found in the former description of 'forest.

'Sisu (*Dalbergia Sissoo*) is still extending rapidly along the 'stony banks of main streams, but Khair (*Acacia Catechu*) does 'not show equally satisfactory improvement, and in Bijni some of 'the smaller trees were found strangled by climbers. Simul '(*Bombax malabaricum*) and Udal (*Sterculia villosa*) only flowered 'partially, but Khair, Koroi (*Albizzia procera*), Uriam (*Bischoffia 'javanica*), *Mallotus philippinensis*, *Butea frondosa*, and the Myro-'bolams yielded flowers and fruit in great abundance.

'Mr. Lloyd states, regarding the Sibsagar division, that Nahor '(*Mesua ferrea*) and many other reserved trees seeded most profuse-'ly. Nahor especially, in the Nambor and Daigurung reserves; the 'young plants of this and former years have established themselves 'freely under more light-demanding species, but under the mother-'tree they get suppressed. In the Desoi reserve it was an excep-'tionally good seed year for the Hollong (*Dipterocarpus pilosus*) 'which here attains enormous dimensions, but no seedlings can yet 'be found; it is recorded that much damage is being done to re-'production in this reserve owing to free grazing allowed under 'the lease granted to a Saw-mill Company.

'In the Lakhimpur division Mr. Copeland reports the repro-'duction of Nahor to be excellent, and of Makai (*Shorea assamica*) 'to be fair: that of Hollong and Hollock (*Terminalia myroiocarpa*), 'the most common trees in the Upper Dehing reserve, is rare, and 'this is attributed to the seed of these two species being the favour-'ite food of green parrots which swarm in these forests during 'the time the seed is forming.

'The season throughout the Garo Hills was unfavourable for 'sál, which flowered but moderately, and the few seeds that 'reached the ground were found to be so perforated by insects as 'to be useless. The following reserved trees flowered and fruited 'abundantly :—Sam (*Artocarpus Chaplasha*); Makria (*Schima 'Wallichii*); Poma (*Cedrela Toona*); Sonalu (*Cassia Fistula*); 'Koroi (*Ablizzia procera*); Gomari (*Gmelina arborea.*)"

Under *Natural Reproduction* the Charduar Rubber plantation is, as usual, the most interesting. The area is 2,104 acres, and some of the older plants are reported to be 77 ft. in height and nearly 17 ft. in girth. But we may be excused for doubting if ordinary height and girth measurements are suitable in the case of a tree which like the banyan has wide-stretching branches with numerous 'drops.' We see that it is now proposed to extend the plantations. Attempts to introduce the taungya plantation system in other Districts have not been successful. The quantity of indiarubber exported from Assam during the year came to 3,518 maunds, while 471 maunds were exported from beyond the frontier. The financial results of the year were :—

	Forest Year.	*Financial Year.*
Receipts ...	4,44,706	4,35,091
Expenditure ...	2,86,425	2,76,834
Surplus ...	1,58,281	1,58,257

There is very little for us to say about the *Ajmere* report which records, as the Government of India put it, "slow but substantial progress on the lines laid down." The most noticeable thing is the establishment of a number of depôts for the storage of grass-fodder against the recurrence of a fodder famine. This seems to be an interesting and important work and at the end of the year 1894-95 there were nearly 11,277 maunds of grass stacked and ready. The store is to be increased up to a certain maximum, which is not stated, and then the collections will be reduced or surplus sold. Such a work ought easily to be made of great value as an assistance to fire-protection, and it should be possible, if the demand is good, to maintain a permanent stock while selling off yearly a portion of the older collections.

The financial results were :—	Rs.
Receipts	12,887
Expenditure	14,794
Deficit	1,907

VI.—EXTRACTS, NOTES AND QUERIES.

The Indian Forest Department and Coopers Hill

In the December number of the *Indian Forester* an article appeared in which the claims of the higher grades of Forest officers to additional pensions was discussed. It was argued that the position of the Inspector-General was analogous to that of a Chief Engineer in the Public Works Department, and that Conservators corresponded to Superintending Engineers; and that, consequently, Conservators were entitled to the extra pension of Rs. 1,000 a year granted to the latter. The argument was based on the Civil Service Regulations and the Prospectus issued officially for the Coopers Hill College course. In the former, section 714 stated that an additional pension of Rs. 2,000 might be allowed, for approved service, to Chief Engineers and the Director-General or Deputy Director-General of Telegraphs; and one of Rs. 1,000 to Superintending Engineers, P. W. D., and Directors in the Indian and Indo-European Telegraph Departments. In the Coopers Hill *Calendar* for 1894-95 (page 20) these particular pensions were also set forth as still sanctioned, and on page 125 the following paragraph appeared: "The more favourable pension rules have recently been extended to Forest officers appointed from England, *who are thus placed on an equality with Public Works officers appointed from Coopers Hill College*. Any Forest officer who has rendered not less than three years' approved service, as head of his department, has also been made eligible for an extra pension of Rs. 1,000 a year." As Conservators are heads of the Forest Department in the provinces in which they serve, it was reasonable to contend that they were entitled to this extra pension of Rs. 1,000, and that the Inspector-General was eligible for the Rs. 2,000 pension, as he was on an equality as regards pay and position with a Chief Engineer or the Director-General of Telegraphs. If this were not the case then the "equality with Public Works officers" was obviously unreal. The publication of the article in the *Forester* had rather startling results. Sir Alexander Taylor, Principal of Coopers Hill College, wrote out that "the criticism overlooked the fact that the concession, 'granted for special reasons, whereby Chief Engineers were 'eligible for an additional pension of Rs. 2,000, was withdrawn by 'Lord Kimberley's despatch of 21st September 1893; and that 'under the operation of that despatch, from the end of 1893, the 'same orders govern the award of pensions to recruits thereafter 'entering from Coopers Hill College, either the Public Works, the

'Telegraph, or the Forest Department." This was the first time that any public mention had been made of this despatch, and the *Forester* returned to the charge. It pointed out in its April number that though 2½ years had elapsed since the despatch was sent out, no alteration had been made in para. 715 of the Civil Service Regulations; and it expressed the belief that Public Works officers were ignorant that the concession to Chief Engineers had been withdrawn. Curiously enough this important announcement conveyed in Sir Alexander Taylor's letter apparently escaped the notice of Public Works officers, for no comments upon it appeared in the press. Now, however, we trust that the matter will be taken up. The Government of India have to explain to the services and the public generally why the Civil Service Regulations were not altered immediately after the despatch of September 1893, and the India Office in its turn has to explain why the Coopers Hill *Calendar* for 1894-95 "published by authority" was allowed to contain paragraph 12, page 20 with its delusive promises. Putting the Forest Department aside, both these official publications contain misleading statements as regards the Public Works, for Chief Engineers appointed since the end of 1893 are not eligible for the extra pension of Rs. 2,000. The Government may possibly point to a Resolution in the Financial Department, dated June 22nd 1895, in which certain officers were enumerated, in eleven departments, as eligible for the extra pension of Rs. 1,000. But nothing whatever was said about the withdrawal of the Rs. 2,000 pension from Chief Engineers, though the preamble contained among other things the line: "Read—Despatch from the Secretary of State for India, No. 188 (Financial), dated 21st September 1893." It had taken 21 months even to mention it as having been "read," but its contents were kept strictly secret save in the Secretariats, why or wherefore we cannot attempt to say. If it had not been for the article in the *Indian Forester* and Sir Alexander Taylor's action thereon it would probably have remained secret until some unfortunate applicant had come to claim the pension he believed to be his. As it is, Sir A. Godley has given the substance of the despatch in a letter which will be found in another column which we recommend to the attention of the rank-and-file of the Public Works Department. Parents and guardians who put their trust in the Coopers Hill prospectus should also study it.

As regards the Forest Department, there is one important statement in Sir A. Godley's letter. It is as follows: "The Forest Regulations for the examination of 1894 applied to recruits entering Coopers Hill College after that examination; and selected Forest candidates of 1894 and subsequent years will undoubtedly—so long as those orders stand—enjoy the same pension rules as their contemporaries of the Public

Works Department. It has not yet been settled how far a Conservator of Forests, belonging to the 1st or other grade, shall be treated as head of his Department. When that has been decided, the decision will be published in India and will be embodied in the Civil Service Regulations." We trust that Conservators will be held to be entitled to the extra Rs. 1,000 pension, but even if this measure of justice is granted the grievances of the Department will by no means have been redressed. A short history of the Forest case will best explain the position. In 1874, when the inadequacy of the pension rules could no longer be ignored, the cases of the Public Works, Telegraph and Forest Departments were treated together. In August of that year a joint Memorandum was prepared by Messrs. Molesworth, Cappel and Brandis—all of them, by the way, Knights in after years. The Government of India did not accept their recommendations, but suggested that the proposals should be revised and brought forward again. This was done eventually in 1882, when a comprehensive memorandum was submitted by Sir D. Brandis who, it is well known, took the lead in the matter. Up to that time the proposals had been made and considered jointly for the three Deparments concerned; but, for reasons not divulged, the P. W. D. then took up their own case separately, with the result that in April 1884 a Government Resolution was published granting improved ordinary retiring pensions to Civil Engineers, and a scale of special additional pensions for Chief and Superintending Engineers (Rs. 2,000 and Rs. 1,000). Some months afterwards the orders were extended to the Telegraph Department—the Forest Department was left out in the cold. Covenanted foresters throughout India at once memorialised the Secretary of State, pointing out (*a*) that His Lordship has already stated that Forest and P. W. D. officers occupied a closely analogous position, and that he had granted to the former many concessions as to service, &c., previously given to the latter; (*b*) that Forest officers were of the same social position, selected in the same manner, and trained at the same College as Public Works officers, and performed duties of equal importance; and that all should, as a matter of equity, obtain the same rules of service; (*c*) that recruitment for the Forest Department would be injuriously affected unless the P. W. D. rules were applied to it; and (*d*) that the hard life and unhealthy surroundings of the Forest officer compelled the average man to retire earlier than other officials. No notice was taken of the memorials. The Government were awaiting the report of the Public Service Commission, and that body eventually strengthened the case of the memorialists by stating that "the 'conditions of service as to leave and pensions should be 'assimilated to those of the Imperal Branch of the Public 'Works Department." After nine long years came a Resolution

granting to the Inspectors-General of Forests, present and future, an extra pension of Rs. 1,000, thus placing the occupant of that appointment on a level with present Superintending Engineers. In 1895, yet another Resolution appeared extending to Covenanted Forest officers the better scale of ordinary retiring pensions laid down in Article 712 of the Civil Service Regulations; and finally in March of the current year was published a despatch from the Secretary of State in which the balance of the demands made by the Forest officers was rejected. These were that the additional pensions (enjoyed by *present* Public Works and Telegraph officers), corresponding to Rs. 2,000 to the Inspector-General and Rs. 1,000 to Conservators of the 1st and 2nd grades, should be granted as a matter of right. Lord George Hamilton in his despatch to the Government of India said:—"You rightly state that such a concession (special pensions) has been repeatedly recommended by the Government of India since 1885; but it has been more than once pointed out, in reply, that privileges granted for exceptional reasons to one Department need not, therefore, be granted to another Department which in many respects was on a different footing." We have failed to find mention of the "exceptional reasons" here alluded to; in the 1884 despatch the additional pensions were authorised simply "as rewards for approved service"—there is certainly nothing "exceptional" in this.

The effect of this long-standing agitation is that the home-appointed Forest officers continue to smart under what they know the Government of India agree with them in considering an injustice. Recruitment for the Forest Branch at Coopers Hill has been so injuriously affected that occasionally sufficient students have not qualified for the appointments offered, and the India Office has been forced to take some of the failures. The physique of some of the recruits has been so poor that special reports on the men sent out are now regularly made by Local Administrations at the request of the Government of India. The India Office may "decline to reopen the question," to quote the despatch of last March, but it will have to be reopened all the same, for questions will be put in Parliament and the case will be fought out to the end. The Secretary of State, in reply to Sir Richard Temple, pledged himself to lay the correspondence on the table of the House, when complete, and when this promise is kept the true facts will be revealed. Meanwhile it may be asked who was responsible for the misleading statements in the Coopers Hill *Calendar* of 1894-95 and in the Civil Service Regulations.—(*Pioneer, June 12th, 1896.*)

The Natal Forest Department.

The '*Revue Agricole*' of Mauritius says that the Natal Forest Department has practically disappeared. It was started in 1891

on the report of M. Fourcade, an ex-student of the French Ecole Polytechnique now in the Cape Forest Department. He was succeeded for three years by a distinguished forester from the Grand Duchy of Baden, Herr Schöpflin, but it would seen that the Natal Government has failed to keep him and he has returned to Germany. The Rêvue goes on to say "it is to be feared that if the 'State has not yet again taken its forests in hand, which have 'already been so severely damaged by the natives, they will soon 'disappear. It would seem that one might well apply to Natal the 'words which were used nine years ago by a distinguished author-'ity before the Royal Colonial Institute' "the British Colonies are 'only playing with their forest question.'"

The Quality of Pine Timber.

The difference in the quality of timber, according to the soil and situation in which it is grown, is so great that the value of any given species as a timber tree can scarcely be gauged with any degree of accuracy, unless we are in possession of full information as to its behaviour under varied conditions. So far as our indigenous species go, we are pretty well posted up in respect to the quality we may expect to find associated with our principal soils, but with introduced and less known trees we have still a good deal to learn. One fact is clearly demonstrated, however, and that is that luxuriance or rapidity of growth is usually an accompaniment to strength and elasticity of timber, and that these qualities are by no means invariably associated with durability. This last quality is probably the one most desired in pine timber, for the extended use of iron for purposes where great strength is required, renders its presence in timber of less importance now than formerly. The relation between rate of growth and durability is nowhere more marked than in coniferous timber. This chiefly arises from the great difference between the spring and autumn zones of the wood, or "annual ring." These two zones are easily recognised by the naked eye, owing to their distinct shades of colour and general appearance, the spring zone being light and ragged on the sawn surface, while the autumn zone is much darker, and has a clearer and more polished appearance on an unplaned tranverse section. Under the microscope the difference in structure is more marked, the spring wood being a mere skeleton of thin cell walls, while the autumn wood shows cells with greatly thickened walls and narrow cavities or *lumina* between them, forming not only heavier and harder, but also more durable wood than that in the spring zone. It is principally the proportion of autumn wood contained in the annual rings which determines the durability of the timber, and this proportion is greatly, though not entirely, dependent upon

the conditions under which the annual growth is made. Until the exact causes which are responsible for these two distinct zones are clearly defined, we are unable to say exactly how the formation of autumn wood is affected by these conditions, the generally accepted opinion is that what the large growth is deferred in spring and continued in autumn, the greater is the proportion of autumn wood. Of equal, if not greater, importance than the period of growth, however, is its rate and the nature of the soil. The better the latter, the better other things being equal, is the quality of the timber, but the latter, we have already said, is usually inversely proportional to the rate of growth. In pine timber of good quality the autumn wood zone occupies from one-third to one-half of the whole ring, where the breadth of the latter does not exceed one-eighth of an inch. Where this breadth is exceeded, however, we usually find the breadth of the spring zone to increase more rapidly than that of the autumn zone. This being the case, it is evident that slowly grown, but otherwise favourably produced, timber contains a larger proportion of autumn wood than that from a tree in which the spring zone occupies the lion's share of the annual rings, and will also be of a more homogeneous nature than timber in which the relative breadths of these two zones show greater divergence. It is not asserted, however, that slowly grown timber is necessarily of good quality, as this latter depends a great deal upon its freedom from knots and general uniformity of texture. For practical purposes only three-fourths or so of the stem are available for running out into deals or battens, the sapwood being discarded for all the more important descriptions of sawn timber. In a tree which grows rapidly in diameter during the first thirty or forty years, the most valuable part of the stem is usually occupied by timber consisting of broad rings containing coarse knots, as rapid diameter growth in the early stages means comparatively unrestricted branch growth. Not only this, but the first few rings from the pith are always deficient in autumn wood, and in such a tree it is not until the sapwood is approached that we come to really clean and well-formed timber.

With the above facts before us it is not difficult to see the advantage of rearing pine timber in close plantations in which the want of space prevents undue development of stem diameter and branches in the early stages. We notice that Mr. Mackenzie in his paper on "Practical and Profitable Forestry," expresses his want of faith in what he calls the German theory of growing pine timber. The German method of growing pine is based upon the requirements of the timber consumer for wood of good quality. What these are may be seen from the specifications of different qualities of Swedish redwood, given on page 8 of the Special Issue of the *Journal*. Freedom from large knots is insisted upon in all the higher classes, and this absence of knots

is just what the majority of our British grown timber lacks, for the simple reason that thinning begins in our plantations before the lower branches are thoroughly choked off, and the best part of the stem is rough and coarse in consequence. (A. C. FORBES, in *Timber Trades Journal*.)

Dr. Schlich's Manual of Forestry, Vol. III.

(FROM 'NATURE,' APRIL 1896.)

Professor Schlich's important work is approaching completion. The two first volumes were noticed in December 1889 and July 1891†. Of these, it is understood, a new edition will soon be necessary. The third volume, which deals with forest management, is about to appear in a Spanish translation. Vol. iv. is an English adaptation of an excellent German book on forest protection, by Dr. Richard Hess, Professor of Forestry at the University of Giess. It is the work of Mr. Fisher, formerly Conservator of Forests and Director of the Imperial Forest School at Dehra Dun in North-Western India. The last volume will deal with forest utilisation. In the present article, we propose to deal with the subject of the third volume, *viz.*, the management of forests.

The management of forests depends upon the objects which the proprietor desires to realise. These objects may be of two kinds: they are either indirect, such as landscape beauty, protection against erosion, landslips, avalanches; or they are direct, the production of timber or other forest produce, so as to yield the largest possible permanent income to the proprietor. Dr. Schlich deals with the attainment of the direct object, that is, with the economic working of forests; but he justly observes, that a forest under good economic management, as a rule, is capable of yielding all those indirect advantages that may reasonably be expected from it.

As explained on a previous occasion, Dr. Schlich's manual is, in the first instance, intended for the instruction of students preparing for the Indian Forest Service at Coopers Hill College. At the same time, there seems good ground for hoping that eventually it may also be useful to proprietors, land-agents and wood-managers in Great Britain, as well as in the Colonies and the United States of North America. The third volume of the manual has a special value for persons interested in the management of woodlands in Great Britain; it is the first really comprehensive work upon this

* "A Manual of Forestry," by William Schlich, C. I. E., Ph.D., Vol. iii (pp. xix + 397). "Forest Management," by William Schlich, Vol. iv. (pp. xix + 593). "Forest Protection," by W. R. Fisher, B. A. (London: Bradbury, Agnew, and Co., 1895.)

† NATURE, vol. xli, p. 121; vol. xliv. p. 265.—*Has since appeared.*—HON ED.

subject that has been published in English, and those who may take the trouble to work through its pages will find that it will enable them to strike out a new line in the management of their woodlands. In 1883, another Indian Forest officer, who had received his professional education in Germany, Mr. J. L. Laird MacGregor, now Conservator of Forests in the Bombay Presidency, attempted to place portions of the subject before English readers, under the title "Organisation and Valuation of Forests." (London: Wyman and Sons.)

At the outset, it will be necessary clearly to understand what the author intends by the term "forest management." Forestry like medicine, engineering, or agriculture, originally commenced as an empirical routine; but its operations are now built upon the results obtained by researches in numerous branches of pure science. The most important of these are mathematics, botany, zoology, chemistry, geology, law, and political economy. Apart from these auxiliary sciences, forestry proper deals with the following subjects: (1) the raising and maintenance of woods, or sylviculture; (2) the protection of forests against damage; (3) the utilisation of forest produce; (4) forest management; (5) forest law.

The last named subject has been dealt with in a separate work* which, though not published as part of Dr. Schlich's manual, essentially belongs to this series of forest publications. The author, Mr. B. H. Baden-Powell, in 1868 was Small Cause Court Judge at Lahore, and consented to be employed during a series of years in the Indian Forest Service, then a small and humble concern, the progress of which was not generally regarded with favour. The main object of this measure was to secure his assistance in the matter of forest legislation. After doing excellent work as Conservator of Forests in the Punjab, and as Inspector-General of Forests to the Government of India, Mr. Baden-Powell resumed his judicial work, and closed his Indian career as Judge in the Chief Court of the Punjab.

The first volume of Dr. Schlich's manual is introductory, the second deals with sylviculture, the third with forest management, the fourth with forest protection, while the fifth will teach utilisation of forest produce. Forest management is built upon the other branches, and under a strictly logical arrangement it ought to be the last volume of the series. This, however, would have delayed its publication. It may be objected that the term "forest management" has a wider meaning in English than that attributed to it by Dr. Schlich, that it comprises all operations of forestry, including sylviculture, protection and utilisation of forest produce. In his manual the author uses it in a somewhat restricted sense, but this restriction is justified; it is convenient, and cannot lead to misconception. In French this branch of forestry is called *Aménagement des forêts*, in German the usual term is

* "Forest Law," by B. H. Baden-Powell, C. I. E., late of the Bengal Civil Service. (London; Bradbury, Agnew, and Co., 1891.)

Foresteinrichtung. MacGregor, in the work quoted, designates a portion of it as *Forest Organisation*. The term selected by Dr. Schlich seems the most suitable.

Forest management, as here understood, comprises three main subjects: mensuration, valuation, and working-plans. Forest mensuration deals with the instruments used, the measurement of timber, standing and felled, it determines the volume of entire woods, the age of trees and woods, as well as the increment of woods. It appears necessary here to draw attention to another technical term, which, though English, is used in a definite sense. Dr. Schlich employs the term "wood" to designate what in German is called *Bestand*, meaning part of a forest forming a unit of fairly the same description. It might be objected that a "wood" is generally understood to mean an isolated small forest block, surrounded by clearings or by prominent natural boundaries. It will be a great convenience if Dr. Schlich's use of the term "wood" is accepted. The volume of a wood standing, say, on one acre of ground, is the product of two factors, the number of trees per acre and the mean volume of those trees. Again, the volume of a tree is the cylinder, height × sectional area, multiplied by a coefficient, called the form factor, which is different for each species, and in each species varies according to age and size of the tree. By a most elaborate system of measurements of many hundred thousand trees of all ages grown in different localities, form factors have now been established in Germany for most of the principal species. These form factors are governed by laws peculiar to each species. Thus, for trees 50 and 1000 feet high of Scotch pine and Beech, the following factors are used to calculate the volume of timber down to three inches diameter:

	50 ft.	100 ft.
Scotch pine	... 0·48	... 0·45
Beech ...	... 0·40	... 0·51

It must be distinctly understood that these form factors are only applicable to forests managed upon proper economic principles, where the trees, while young, are allowed to grow up crowded in compact masses, so as to form straight well-shaped stems, free from knots and branches, and are afterwards thinned out methodically, with the object of leaving in the final crop only well-shaped round trees, likely to yield the most valuable imber. To trees grown in open park-like woods, these form, actors would not be applicable.

Hand in hand with the determination of form factors, yield tables have been prepared in Germany for the principal species. These yield tables give the volume of timber in completely stocked woods of the different species standing on a given area at different ages, and in localities of the different quality classes. The work of examining the data upon which these yield tables have been based, has led to an important result, *viz.*, that the mean

height of a wood as a rule indicates the quality of the locality. On good soil and under conditions otherwise favourable, the mean height of a wood is much greater than one of same age which has grown up under less favourable conditions. Indeed, it is possible, with the help of yield tables, to ascertain the volume of an even aged wood, the age of which is known, by determining the mean height of the trees composing it. The following extract from the yield table for Scotch pine in Germany, mainly taken from the figures given by Dr. Schlich, may serve to explain this :—

Volume and Volume-increment of Timber down to 3 inches in diameter. Net value and Value-increment. All on one acre, stocke dwith Scotch pine of middling quality.

Age, years	60	70	80	90	100
Number of trees per acre ...	516	393	316	266	230
Mean height, feet	51	57	63	67	71
Volume, cubic feet solid ...	3713	4183	4587	4902	5158
Current annual increment, cubic feet, solid	47·0	40·4	31·5	25·6	
Volume increment, per cent.	1·2	0·93	0·60	0·51	
Net value of stock (shillings)	1186	1683	2225	2789	3376
Volume and value increment, per cent.		3·76	2·83	2·29	1·93

If two woods, known to be 60 and 100 years old, have a mean height of 51 and 71 feet respectively, it follows that they belong to the class, of which an extract is here given, which is known as the third or middling class, and, if completely stocked, the volume standing on one acre would be 3713 cubic feet in the one, and 5158 cubic feet in the other class. Other Scotch pine woods of the same age, if their mean height were greater, would belong to a higher quality class, and if fully stocked, their volume would be that recorded in the yield tables under their class. It stands to reason that in woods not fully stocked the timber per acre is less in inverse proportion to the degree of completeness.

The great practical importance of height growth will perhaps be better understood by reference to matters which, many years ago, have exercised considerable influence upon the development of regular forest management in India. The writer of these lines, on taking charge, in January 1856, of the Pegu teak forests, made it his first duty to ascertain which were the most valuable forest tracts in that country. The number of teak trees of the different age classes on the square mile, he ascertained by a system of linear valuation surveys, laid through the forests in all directions. At the same time he measured the height of trees in all districts. The data thus obtained, the timber standing on the ground, and the height of the trees, particularly of the younger classes, enabled him to classify the fo-

rests, and to pick out those which were the most valuable. The measures which he had introduced had gained him the confidence and goodwill of the Karen and other inhabitants of the forests, for those measures gave to the people profitable employment in timber operations, and this made them allies, instead of enemies, in regard to forest protection. The merchants of Rangoon, on the other hand, naturally desired to get the forests into their own hands, and, backed by the influence of the powerful mercantile firms of Calcutta, they induced the Government of India to order the Pegu forests to be thrown open to private enterprise. These orders had to be carried out; but, fortunately, they did not require that the whole of the forests should be thrown open at once. Those districts, therefore, in which the growing stock of teak timber, in regard to height and otherwise, was most promising, were for a time retained under control of the Forest Department, while the rest were thrown open to private enterprise, in accordance with the orders received. This was in 1861. Subsequently a different view of the question was taken by Government; the arrangements which had been made could not, however, be cancelled. The mischief had been done; but, fortunately, it had been limited to the less valuable districts. The really valuable forests, which had been reserved in 1861, had been saved, and this made it possible to maintain a profitable system or regular management.

The little table, entered on page 511, illustrates the growth of a Scotch pine wood middling quality between the ages of sixty and a hundred years. As the wood advances in age, the number of trees diminishes but the remaining trees are taller and heavier, and hence the total volume increases. During these 40 years no less than 286 trees have died or been thinned out, and the skill of the forester consists in this, that the final crop is composed of sound and well shaped trees, so that their timber may fetch the highest price obtainable. These figures show further, that, while in the first period of 10 years, between 60 and 70, the timber produced per acre amounted to 470 cubic feet, or 47 cubic feet a year, only 256 cubic feet, or 25·6 cubic feet annually, were produced from the 90th to the 100th year.

The current annual increment is greatest while the forest is young, in the case of Scotch pine between the ages of 30 and 40, after which it diminishes steadily. The annual increment may be regarded as a percentage of the growing forest capital. Between the years 60 and 70 the increment per cent. (p) would be determined by the formula: $4183 \times 3713 = (1{\cdot}0p)^{10}$ which makes p—1·2. Between the years 90 and 100 the increment per cent. is only 0·51. The maintenance of a forest, which increases at a rate so slow and so steadily diminishing, at first sight appears to be a most unprofitable undertaking. Fortunately the market value of the timber up to a certain point increases with the age of the wood. The net value

of the growing stock (less the cost of cutting, carriage, and other expenses) of the wood exhibited in the table at the age of 60 years is 1186 shillings, rising to 1683 shillings at the age of 70. During this period the value and volume-increment per cent. is 3·76, but it falls steadily to 1·93 per cent. between the years 90 and 100. Obviously, from a purely financial point of view, it is best to cut the wood when it is between 80 and 90 years old, and to invest the proceeds in Consols at 2½ per cent. for its maintenance beyond that age entails a loss of interest. The increment, that is the interest on the growing capital of the forest, is less than can otherwise be obtained on perfect security.

It is also evident that the volume-increment per cent. may be used to aid in determining the most profitable rotation to adopt in the management of a forest. In the vicinity of coal or other large mines, where pit props find a ready sale, a rotation between 60 and 70 years, and even lower, would be most profitable. Where, however, the chief demand is for building timber, or there is a risk lest an over-production of smaller wood might lower prices, rotation should be higher, 70 to 80 or 80 to 100 years. The value and volume-increment per cent. does not, however, correctly express the rate at which the forest capital works. For this purpose the formula must be completed by inserting the annual expenses for taxes, anministration, &c., as well as the rent of the soil. The result is called the *forest per cent.* To discuss this part of the subject would, however, lead too far on the present occasion.

Part ii deals with forest valuation. Obviously it is often necessary, when a forest is to be divided, or assessed or sold, to determine its capital value. The English reader may be disposed to think this an extremely simple matter. The value of piece of property is either its selling value or its productive value, and these can readily be ascertained by the prices paid for forest land in the open market, or by the rent derived from forest land. Sales of forest land, however, do not often occur, and when a sale takes place, the price realised for one piece or forest does not give the value of another piece. Soil, aspect, elevation, and the other factors which influence the annual timber production and the rate at which the timber can be sold, must be considered, and more than these, the actual condition of the growing stock depending upon species, age, and previous treatment.

Nor does the rental of forests come to our aid ; forest lands, as a matter of fact, are not often leased out, the difficulty being to make sure that the capital value of a forest has been maintained unimpaired during the lease. The rent obtainable from a field, or from a piece of grass land whether let as a sheep-walk or for shooting, is known or can readily be ascertained. The same holds good in the case of osier-beds, which are cut over annually or every second year, and, in the case of coppice woods, which are worked on a short rotation. In all these cases the yield is approximately the same every year,

and so is the annual outlay for labour and manure. Matters are complicated where standards are held over in the coppice, and more complicated in the case of high forest. A piece of high forest consists of trees which require eighty or hundred years, or even longer, to come to maturity. It consists of woods of all ages, and in the same wood trees of different species and of different ages are often found mixed. Under good management, a piece of high forest, if of sufficient extent, ought to yield, year after year, approximately the same quantity of timber, and hence a forest under a good system of management, in accordance with a well-considered working-plan, is analogous to a field or meadow. When this, however, is not the case, it obviously is not a simple operation to determine the annual yield and the capital value of a forest. The annual yield is derived, in the shape of thinnings and final cuttings, from certain compartments this year, and from other compartments another year. Data extending over a long series of years would be needed to ascertain its average amount.

It may be objected that the capital value of a forest consists of two items, the value of the land and the value of the growing stock; that the former can generally be estimated within narrow limits, and that the latter should be calculated by adding up the market value of the timber standing in each compartment. This method, however, would leave out of account all young woods, which do not yet contain marketable timber; it would, in fact, treat them as blanks. The result of such a proceeding would be misleading, for obviously the capital value of a forest depends upon the yield which may in future be expected from it. And the future yield depends quite as much upon the condition of the young woods, which eventually are to furnish thinnings and the final crop, as upon the timber which at the present time happens to be marketable.

On the assumption that a forest is worked in accordance with a system settled beforehand, its capital value and its rental can obviously be calculated with the aid of yield tables. All net income, that is, the amounts expected to be realised by the sale of timber, less the cost of cutting, carriage, and other expenses, is discounted to the present time, and from the present value of all income is deducted the present net value of all expenses expected to be incurred upon the property. The result thus obtained is called the expectation value. Starting from an area not stocked, the *soil expectation value* is obtained. Thus, on the assumption that Scotch pine is to be planted, the soil expectation value of an acre of land of middling quality, such as that to which the data given on page 512 relate, will be as follows:—

Under a rotation of		With a net rental of
60 years ...	... 196*s.* ...	... 4·90*s.*
70 „ ...	... 236*s.* ...	... 5·91*s.*
80 „ ...	... 250*s.* ...	... 6·25*s.*
90 „ ...	... 245*s.* ...	... 6·14*s.*
100 „ ...	... 229*s.* ...	... 5·73*s.*

In calculating these values, the question had to be settled which rate of interest should be employed. As regards security, forest property has the drawback of possible damage by fire, storms, snowbreak, and insects. On the other hand, once placed under systematic management, a forest yields approximately equal returns annually, while those of fields and grass-lands vary according to the seasons. Once established, a forest requires less labour, and can be left alone for a time without much risk, for the timber continues to grow all the same. Lastly, the yield of several years may be anticipated, if money is wanted, or if it is desired to take advantage of a temporary rise in timber prices. These are substantial advantages of forest property, which make it a desirable investment, and therefore justify a low rate of interest. In these calculations, as well as in all others in this portion of his manual, the author has employed the interest of British Consols, that is, 2¾ per cent. The calculation of the soil expectation value will be understood at a glance by stating the formula for a rotation of 80 years:

$$S_e = \frac{Y_{80} + T_{30} \cdot 1{\cdot}025^{50} + \quad + T_{70} \cdot 1025^{10} - e\, 1{\cdot}025^{80}}{1{\cdot}025^{80} - 1} \cdot \frac{e}{0{\cdot}025}$$

Y_{80}, the final yield at the end of the rotation is, according to the table given, worth 2225 shillings; the thinnings at the ages of 30, 40, 50, 60 and 70 years are worth $T_{30}=4$, $T_4=36$, $T_{50}=67$. $T_{60}=86$, $T_{70}=91$ shillings. These values are all prolonged to the end of the rotation, and the same is done with e, the cost of formar tion, here assumed to amount to 60 shillings, which is deducted from the sum of final and intermediate yields. The difference is the rent yielded by the forest every 80 years, that is, at the end of each rotation, and the present value $\frac{r}{1{\cdot}0p^{80}-1}$ of this perpetual rent, after deducting the capital value of e, the annual expenses for administration, taxes, &c., ($e=3s.$) represents the soil expectation value.

All other data remaining the same, the value of S_e varies with the length of the rotation adopted, and in the present case its value culminates for a rotation of 80 years. Obviously this is financially the most profitable rotation which yields the highest net rental, 6·25 shillings per acre. Under this rotation the capital value of the growing stock is utilised to its full extent; if the wood is allowed to grow older, both soil expectation value and net rental diminish. It will be understood that on the data here assumed, it will pay to plant Scotch pine on land of middling quality, if that land can be purchased at 250 shillings, (£12 10*s.*) or less an acre.

The method here explained can be employed to determine the expectation value, not only of land, on the assumption that it is to be planted up with Scotch pine or other trees, but also of existing forests. The expectation value of a normal forest, for instance, consisting of 80 compartments of one acre each, all of the same

middling quality, completely stocked with Scotch pine, in a regular succession of ages, the wood on the youngest compartment being 1, that on the oldest 80 years old, would stand as follows :—

	£		£ s. d.
Growing stock ...	3418	or, per acre ...	42 14 6
Soil	1000	,, ...	12 10 0
	4418	,, ...	55 4 6

It must be distinctly understood that these calculations are based upon assumptions, which may not in all cases be realised. The first assumption is that the plan adopted, upon which the formula is based, will be strictly carried out, that thinnings and other operations will not be interfered with by fires, storms, snowbreaks insects, or other damage, and that the areas will always be fully stocked with even aged timber. The second is, that the data of the yield tables will actually hold good in the case in point. The third assumption is, that the prices realised by sale of the timber, that wages and other circumstances which govern the value of *c* and *e*, will be, and remain, as entered in the calculations.

There is some analogy with engineering formulæ. These the practical engineer uses as his guide, not blindly, but with circumspection and with due consideration of all circumstances which may affect the result. The difference is this, that the forester attempts to express by a mathematical formula the growth of trees, of organised beings the development of which is governed by a multitude of influences, varying incessantly. Nevertheless, if used with due caution, these mathematical formulæ, elaborated with praiseworthy perseverance by foresters in Germany, will be found most useful aids in considering the difficult problems which forestry presents in all countries. Some of these problems can, others cannot, in the present state of our knowledge, be solved by the use of mathematical formulæ. Space forbids a further discussion of this subject.

In the Kingdom of Saxony the State owns a forest area of 430,000 acres, which, after deducting all expenses, yields a mean annual net revenue of £300,000 or 18*s*. per acre. For many years it has been an established practice to determine, at intervals of ten years, the capital value of each forest range, soil and growing stock, to calculate the rate of interest which under existing management, that capital yields. The total area consists of 107 forest ranges or executive charges, and authentic statements, giving the financial result of forest management in each range, are published annually. During the five years ending with 1892 the average capital value of the entire area (soil and growing stock) amounted to 15 millions, or about £36 an acre. During this period, therefore, these forests have yielded interest on the capital involved at the rate of 2·6 per cent. Many of the 107 forest ranges have yielded less than 2 per cent., but a large number regularly yield more than 3 per cent. Compared with State forests in other countries of

Germany, those of Saxony have great advantages. The country is densely inhabited, up to the edge of the forests, factories and other industrial establishments are numerous, and there is a complete system of roads and railways. The consequence is, that timber, even of moderate dimensions, commands high prices, and that the produce of thinnings find a ready market. Under these favourable circumstances, most of these forests are worked on a short rotation, which, it will be evident from the preceding remarks, is always more likely to lead to good financial results, than if the woods were permitted to attain a great age. A large portion of this area has gradually been converted into pure spruce forests, managed on a rotation of eighty years. On other grounds, it may, perhaps, not have been wise to rely upon pure spruce forests. Up to the present time, however, there has been no serious damage from insects or fungi.

In most other countries of Germany the public forests—that is, those which belong to the State, to towns, village communities, and other public corporations, and most of the larger private, forests—are managed on rotations considerably longer, and the consequence is, that the capital involved (soil and growing stock) does not yield as high interest as in the State forests of Saxony. The Spessart, for instance, an extensive forest area belonging to the State in the Kingdom of Bavaria, contains a large growing stock of old oak timber, 250 to 450 years old, which, if cut and sold at the present time, would fetch about £1,50,000. The existing working-plan governs operations during a period of 120 years, from 1888 to 2007, and particularly prescribes the manner in which the old standing oak timber shall be utilised. About 60 per cent. of the quantity alluded to consists of trees 300 to 450 years old, with hardly any volume or value-increment. These it is proposed to cut during the next forty years. If they were cut now, and the proceeds were used to redeem part of the State debt, upwards of £27,000 a year would be saved in interest. The remaining 40 per cent. consist of trees now about 250 years old. These will furnish the yield in oak timber from 1936 to 1983, and when they are cut the volume will be greater, and the timber, being larger, will fetch much higher prices. Nevertheless, in the case of this portion, also, there will be considerable loss of interest. This sacrifice of interest is made deliberately by the Government of Bavaria, with the full consent of the Parliament at Munich, because it is considered desirable to maintain a regular supply of oak timber from this source, upon which numerous industrial establishments in the large villages all round the Spessart to a large extent depend.

And there are many other forest tracts in Germany of large extent, both public and private, which still contain enormous stores of old-growing timber, the inheritance of several centuries. In such cases it is right on many grounds to spread the removal of the old timber over a long series of years, and

rather to work the forests on conservative than on purely financial principles. In Great Britain, however, circumstances are more similar to those which exist in Saxony, and hence, in the management of its woodlands, financial considerations will probably preponderate.—(*Nature.*)

(*To be continued*).

VII.—TIMBER AND PRODUCE TRADE

Churchill and Sim's Circular.

4th June 1896.

EAST INDIAN TEAK.—The deliveries to the end of May 1896 amount to 9,592 loads compared with 6,200 loads for that portion of the previous year, and for May alone to 2,411 loads this year compared with 2,838 loads in 1895. The stock has been reduced in the month, and the market is being quietly held for full prices. Buyers and consumers continue to struggle against the enhanced cost brought about last winter by naval demands, but at present there is no visible prospect of any cheaper prices.

ROSEWOOD.—Stocks have been cleared, but small shipments are sufficient to supply the limited demand.

SATINWOOD.—For figury logs and good boards there is some enquiry.

EBONY.—East India finds buyers in small lots at satisfactory prices.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	,, ton	£6	to	£10
Satinwood	,, sup. foot	8d.	to	12d.
Ebony	,, ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, June 1896.

Cardamoms	per lb.	1s. 5d.	to	2s. 8d.
Croton seeds	per cwt.	65s.		
Cutch	,,	17s	to	32s. 6d.
Gum Arabic, Madras	,,	45s.	to	65s.
Gum Kino	,,	£20	to	£25.
India-rubber, Assam	per lb.	1s. 10d.	to	2s. 3d.
,, Burma	,,	1s. 4d.	to	1s. 11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.
,, Jubbulpore	,,	3s. 9d.	to	6s.
,, Godavari	,,	2s. 6d.	to	4s. 6d.
Nux Vomica, good	,,	4s. 6d.	to	6s.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Sapanwood Madras	,,	£4	to	£6 nom.
Sandalwood, logs	,,	£30	to	£50
,, chips	,,	£4	to	£8
Seed lac	,,	70s.	to	95s.
Tamarind	,,	6s.	to	7s.

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, Bareilly and Delhi, for the month of May 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sâl, 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sâl and Sain, &c., Karis 12 × 5″ × 4″ { Sal ...	50 0 0	60 0 0			
{ Sain	30 0 0	40 0 0	...	...	
Sâl bed posts, 7 × 2½″ × 2½″	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sâl, 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sâl and Sain, &c., Karis 12′ × 5″ × 4″ ...	30 0 0	40 0 0	..	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	40 0 0	100 0 0 500 0 0	
BAREILLY.					
Sâl 10′ Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sâl and Sain, &c., Karis, 12 × 5 × 4″ { 25 0 0	{ 35 0 0	...	..		
{ 40 0 0	{ 50 0 0	...	...		
,, ,, ,, ...	60 0 0	25 0 0	...	...	
Sâl bed posts, 7 × 2½″ × 2½″ ...	10 0 0	0 0 0			
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	137 0 0	
DELHI.					
Sâl, 10′ Tors (Poles) ...	7 0 0	10 0 0	...	...	
Sâl and Sain, &c., Karis, 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0	...	...	
{ Sain...	25 0 0	30 0 0	...	...	
Sâl bed posts, 7′ × 2½″ × 2½″ ...	9 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	25 0 0	75 0 0	

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Some Remarks on the Forest Report of the Central Provinces for 1894-95.

"For the purpose of justifying the large extensions made recently in regular Working-Plans in the Circle, the Forest Department in this Circle is put upon its defence."

Thus writes the Conservator, Northern Circle, in his Annual Forest Administration Report for the year under review. And, if at the same time the alarming decrease in the revenue be taken into consideration, there can be no doubt that in many respects the Department is indeed "put upon its defence." The fact is the receipts from the forests have been showing a steady but very marked decline during the past three years, clearly tending to show that some abnormal influences must have been at work. The following figures speak for themselves :—

	Receipts.		*Expenditure.*		*Surplus.*
	Rs.		Rs.		Rs.
1892-93 ...	14,48,508	...	9,79,590	...	4,68,918
1893-94 ...	10,92,618	...	8,42,110	...	2,50,508
1894-95 ...	10,43,306	...	8,79,039	...	1,64,267

Over-cutting in private forest areas ; agricultural depression ; lowering of rates ; larger expenditure—all these may and, undoubtedly, have had a more or less marked effect during the past year *in lowering* the receipts of the Department ; but it is incredible to suppose, as the Chief Commissioner would have us believe, that these are in themselves sufficient to account for the continuous and steady collapse in receipts which has apparently set in.

We must suppose then that other causes have been at work ; causes which the Local Administration appear to ignore.

Turning now to the Provincial Annual Reports for the past years, it will be found that this steady fall in the receipts first manifested itself in the year 1892-93, the year in which the old system of working the forests was abolished. And merely by a reference to the Report for this period it will, we think, be made sufficiently clear that the sudden *boulversement* in the system of working the forests, which first occurred in that year, has without a doubt either directly or indirectly influenced the revenues. It is, however, indeed remarkable that apparently no serious attention has been given to this matter by the Local Administration.

It will be remembered that in the year 1892 a new working scheme was introduced throughout the Province. In accordance with its provisions all unregulated fellings were forthwith to be abolished and Provisional Working Circles, and annual coupes were to be introduced—a system of working which would perhaps have been better described merely as one of located fellings. The idea in itself was an excellent one, a step which had long been called for, superseding as it did the ruinous unsystematic "non-working" of the forests, by regulated and systematic workings. Unfortunately, however, it was thought necessary to introduce this new scheme with lightning rapidity. It appears evident that the old system was abolished before the Department was in any way prepared to replace it by the new. The Department has thus, during the past three years, been passing through a reconstructive stage, during which it has been hard at work building up a new scientific system for working the forests to replace the old unregulated system which was suddenly abolished in year 1892-93. Under these circumstances can it be wondered at that the revenues have shown a marked fall during the three years 1892-93 to 1894-95, a period during which the Department was of a sudden deprived of the means of making money, and has since been busy constructing that which it is hoped will again enable it to throw its goods on the market? It would be very much the same if by some calamity the whole of the rolling-stock of a railway were suddenly destroyed. Makeshifts might for the time bring a few small earnings ; but the result would be loss of revenue ; and, not until new rolling-stock was obtained could the full earnings be looked for. So it is in the Central Provinces. It will not be until the new system is in working order, that is, until all the working-plans, Regular or Provisional, have been prepared that a rehabilitation of the revenue can be expected. And here it is necessary to add that this again wholly depends on the assumption that the plans will have been so constructed as to fully meet the requirements.

In support of the conclusions above arrived at, it now only remains to turn to the reports themselves for full corroboration.

At the same time attention will be called to the progress actually made in the systematic working of the forests, as well as to point out how far these results do indeed appear to affect the revenues. Turning to the Annual Report for 1892-93, it appears that the new working scheme, above described, first saw the light of day at the end of November 1892. And Mr. Thomson, the Conservator, Northern Circle, in his Annual Report for that year writes :—" On the 1st of April 1893 in all forests thoroughout the Northern Circle, all unregulated fellings by license-holders had altogether closed ; 248 coppice working circles have been localized and opened for systematic fellings in the Conservator's charge, the said working circles having an aggregate area of 1417·5 square miles, or 907,235 acres. The method of treatment proposed is that of compound coppice, leaving a rich store of reserves, numbering not less than 60 per acre." And again :—" It is fully expected that finished plans for all the working circles now established will be completed for submission, and for the approval and sanction of the Local Government and the Inspector-General of Forests, before the close of the current year 1893."

The above was the record of four months' work in the Northern Circle. On the other hand the Conservator, Northern Circle, Colonel Doveton, described as follows the work attempted in his Circle during eight months :—" Working-plans do not exist in this Circle. An effort has been made to effect a complete subdivision of the forests into working circles, a fixed area of which might be worked each year. The result of this attempt has not been altogether satisfactory ; *but it was a gigantic undertaking to attempt in so short a time.* The main end has however, been arrived at, namely, the immediate location of all cuttings within fixed limits, except in respect of certain remote forests on which there is at present no demand."

Turning now to the financial results of this year, there can be no doubt that in reality the introduction of this new system of working had no time to cause any appreciable effect on the revenue, and though the work apparently accomplished in the Northern Circle was phenomenal, there is reason to believe that the Conservator was misinformed. As a matter of fact, there was actually a small diminution in the receipts from both Circles.

In the light of subsequent events it is, however, interesting to read the Chief Commissioner's remarks in his review :—" It is possible that difficulties connected with the starting of the Provisional working scheme may have somewhat retarded the growth of forest income, but the Chief Commissioner anticipates that the facilities for obtaining and removing produce which that scheme will ultimately give, will do more to improve the income from our forests than any administrative step that has been taken in recent years,"

To sum up then the work of the year. In the Northern Circle, 248 working circles, occupying an area of 907,235 acres,

were established, and the Conservator fully anticipates that finished working-plans for all these circles will be completed by end of 1893. In the Southern Circle located fellings were as far as possible introduced. Finally, the revenue shows a slight decrease, but the Chief Commissioner anticipates an improvement due to introduction of new working schemes.

It is now necessary to turn to the following year 1893-94. Regarding the work accomplished in the Northern Circle, the following details are gathered from the report of the Conservator, Mr. Thompson. The total number of working circles said to have been in working order are 317, occupying a total area of 1,689,613 acres. "For some, regular working-plans, drawn up according to the provisions of the Forest Department Code, 4th Edition, have been compiled," and, "till regular working-plans take the place of the provisional working scheme, the management of the working circles will be regulated by the provisions prescribed in the latter. This provisional scheme is in itself a working-plan,"(whatever this may mean) "but it is now being rapidly replaced by regular working-plans."

Lastly, "The number of working-plans reports completed during the year is 36; the number of working circles now provided with regular plans is 80; and the areas covered by the plans aggregate 623,153 acres, which is equivalent to 973 square miles."

The Southern Circle report was written by the officiating Conservator, who had only just taken charge of the Circle. To quote from a subsequent report—"owing to the complete want of local knowledge on the part of the officer who was acting as Conservator when the report was drawn up and the very difficult position that officer was placed in, in thus having to prepare a record of the year's work with no personal experience to guide him in the undertaking," it is difficult to arrive at a correct idea as to what was actually done. It appears, however, that—"unregulated fellings have been abolished over about 1½ million acres or 30 per cent. of the workable and accessible forest area, for which plans are required. About half of this area, or 773,12) acres, had been brought more or less under the treatment of working-plans either complete or preliminary, and the balance was managed under the system of provisional schemes providing for localized coupers which were so situated that they could subsequently be absorbed in the arrangement of more regular and systematic plans."

It only now remains to turn to the financial results:—

	1892-93. Rs.	1893-94 Rs.
Receipts ...	14,48,508	... 10,92,618
Expenditure ...	9,79,590	... 8,42,110
Surplus ...	4,68,918	... 2,50,508

These are indeed sufficiently appalling, showing as they do a decrease of Rs. 2,18,410. It is necessary to turn to the review of the Chief Commissioner for any remarks which may throw light on these figures ; and the following quotations will be read with interest:—

"Now that the working of the forests under organized plans is beginning to be better understood by the people, the forest receipts are bound to rise." Under para. 10 of his review the Chief Commissioner proposes to still further lower rates, and adds :— "The Chief Commissioner does not apprehend that the forest revenues will be in the least reduced, for it is evident that large sales at low rates will be better for the Department than the stagnant sales of last year on the current terms. The receipts and prospects of the forests, he believes, will be simultaneously improved."

Again, to sum up the work of the year. In the Northern Circle, 317 working circles were established, 80 of which were apparently provided with working-plans. In the Southern Circle unregulated fellings were abolished over 30 per cent. of the forests and about half this area has been brought under the provision of Regular or Provisional working-plans. Lastly, as regards revenue, an alarming decrease has to be recorded.

The year under review, 1894-95, is now reached, and after a perusal of the Annual Reports of the previous years, purporting as they do to give a record of the work which is supposed to have been accomplished year by year in the two Circles since the introduction of the new working scheme, it is difficult to understand the wonderful transmutation which has occurred in the results of the work of the two Circles. It has been seen that in the year 1892-93 the Conservator, Northern Circle, showed a considerable amount of work done in the preparation of working-plans, and, to quote his words, he "fully expected that finished plans for all the working circles, now established, will be completed for submission...before the close of the current year" (1893). On the other hand, the Conservator, Southern Circle, merely remarked that "working-plans do not exist," but "the main end has been arrived at." Now, at the close of the year 1894-95, it is found that the Southern Circle "possessed complete plans for 703 square miles, and had taken in hand preliminary plans for 4,652 square miles, and it may be noted that of these latter most had been forwarded to the Inspector-General of Forests for criticism, and a large number had been returned approved, and are now in course of being drawn up as complete working schemes."

Again, "it will be understood that we have now some 5,855 square miles of forest, or 74 per cent. of the total area possible of being brought under methodical and systematic regulations and that another season's work should see the balance of all the accessible tracts in this Circle brought under similar treatment." On the other hand, as regards the Northern Circle, it is found that

though preliminary plans have apparently been prepared for 1,000 square miles of forest, none have yet been "subjected to the criticism of the Inspector-General of Forests and the opinions of the local officers." It is fair to add, however, that apparently the above plans "were submitted in complete form for the Chief Commissioner's orders." And the Conservator, Northern Circle, again adds, "working-plans for all forests in all divisions, excepting Mandla, will be completed in manuscript by the end of the forest year 1895-96." So far, so good ; but the financial results again show the most alarming results, as will be seen from the following figures :—

	1893-94	1894-95
	Rs.	Rs.
Receipts ...	10,92,618	... 10,43,306
Expenditure ...	8,42,110	... 8,79,039
Surplus ...	2,50,508	... 1,64,267

A further decrease in the revenue of Rs. 8,12,241 has thus to be recorded.

Enough has been said to show conclusively that the years of "unpreparedness" which have intervened between the abolition of the old unscientific and unregulated system of working and the present working scheme must undoubtedly to a very large extent be responsible for the abnormal fall in the receipts which has occurred.

Leaving out of consideration the attempts made in the Northern Circle to attain the impossible, there can be no doubt that the reports of both Circles show a remarkable record of valuable work performed—work which cannot but be thoroughly appreciated and welcomed by all Forest officers. It is indeed something to boast of that in four short years almost the whole of the Government forests in the Province will have been brought under systematic working and will be governed by the provisions of regular working-plans sanctioned and approved by the Government of India. Apparently in the year 1892 not a single working-plan existed in the Province. In the year 1897 not a stick will be removed except as laid down in the sanctioned working-plans. And now that the working-plans are being completed and that the forests as a whole will for the first time be brought under regular prescribed workings, it remains to be seen whether the revenue will show a corresponding rise. The year 1897 will be the first in which the new system of working can really be tested. That year should then show a marked rise in receipts, and, it must be added, that if this is not found to be the case, then the only conclusion to be arrived at will be that the working-plans as prepared are not suitable to meet the requirements of the people and of the local markets.

Turning now to other matters appearing in the Central Provinces Forest Administration Report for the year 1894-95, there can be no doubt that there are indeed other questions which do very materially influence the revenue. And again it is curious to find that the most important of these is altogether ignored by the Local Government. We refer to the excisions of forest areas for ryotwari settlement by the Revenue Department. Enormous areas have thus been disforested, and as this is a question which is not generally understood, a few words in explanation may be given.

Roughly speaking, at the last settlement, thirty years ago, certain areas were selected by the Forest Department throughout the Province for converson into Government Forest Reserves. In addition to these areas, moreover, very extensive tracts remained with the Local Government as waste land. At first these remained under the Revenue authorities, but at a subsequent date, perhaps ten years ago, these areas also were placed under the management of the Forest Department. In these areas a considerable number of fields and villages existed and in fact, many of the tracts consisted of little else but cultivation.

In accordance with recent orders, all such areas, and in addition many other culturable areas have been selected for excision and are now being disforested. The procedure is a good one, with this exception, that unfortunately large areas have been disforested which should have been maintained as forest. Naturally all this has greatly tended, for reasons which need not here be entered into, to considerably lower the revenue, and there is no doubt that the results of this excision on the forest receipts will be still more felt in subsequent years.

The Central Provinces, as usual, show remarkable success in regard to fire-protection. On the whole, 6,521 square miles were fire-protected ; in the Southern Circle 99 per cent. of the protection was successful, and in the Northern Circle 92 per cent. It is unfortunate that no correct estimate of the cost can be obtained for comparison. In the Northern Circle it appears that in calculating the cost large areas on which no particular expenditure was incurred have been added to those in which systematic fire-protection was undertaken, and a special establishment employed. Thus we read that "46,000 acres of the Hurda Range have been protected at a total cost of Rs. 8 altogether." In the Southern Circle the expenditure amounted to Rs. 10-15-5 per square mile.

It is to be feared that the great importance of works of communications and buildings is not sufficiently appreciated in the Central Provinces ; and nothing of importance has to be recorded. Similarly, nothing has been done as regards artificial reproduction ; but, perhaps, this is not necessary if the Forest Officer, Nimar, had been correctly reported in Appendix A by the Conservator, Northern Circle. He writes :—"Most of the principal species seeded most profusely during the spring and summer of 1894, so that at

the commencement of the rains the ground was simply covered with a layer of seeds. The monsoon breaking out early greatly favored germination, and the result was that at the close of the rains the ground was carpeted with seedlings." This it is fair to add being the result of "a careful study of the state of natural reproduction made during the year."

"C."

Too much Fire-protection in Burma.

No. 4.

The following remarks appear in para. 26 of the report on Forest Administration in the Pegu Circle, 1894-95 :—

"The Divisional Officer, Tharrawaddy, states as follows :—

(*a*) That fire-protection permits the formation of humus and prevents that burning of the soil into red bricks which is such a feature in unprotected forests where the soil is argilaceous.

(*b*) That this humus forms a better seed bed, and that seeds are not washed down into gullies by the rain as is the case when the soil is baked and left exposed.

(*c*) That teak, however, as its seed takes longer to germinate than the seeds of fast growing grasses, bamboos, &c., fares badly in the struggle for existence and is kept back by being overtopped and is often suppressed.

(*d*) That teak seed is less affected by fire than the seed of most of the inferior species, and is as a rule but little damaged by the ordinary ground fires, and is therefore in unprotected forests often left in undisputed possession of the soil.

(*e*) Teak seedlings also suffer less from fire than the seedlings of other species. They may be burned down, but will spring up again year after year until they are strong enough to resist fire. It is probable, however, that a great deal of our hollow timber is due to this burning. Cutch, *pyinkado* and many other seedlings, however, do not survive a burning."

Again, para. 50, Report on the Forest Adminstration in the Western Circle, 1894-95.

"Teak is generally associated with bamboos, *the cover of which prevents the germination of teak seed,* or soon suppresses seedlings which have germinated."

Criticism on the above.

(*a*) Theoretically, of course, fire-protection, if successful, should promote and permit the formation of humus. Unfortunately, as far as I have been able to observe in the Prome Division, it does not do so at all. Soon after the commencement of the rains, I noticed last year in the Chaungzauk reserve that whiteants (?) eat up all the leaves and dead grasses that were lying about; in other parts of this Division, too, I have noticed that decaying vegetation, sticks, logs, &c., are permeated with whiteants and earth-worms, &c. The result is not humus, though I have no doubt that much matter is worked into the soil, which is thereby improved. In parts of the Chaungzauk reserve which have been successfully fire-protected for 16 years now, though the forest is moister than the parts which have not been protected, I have failed to notice that humus has been formed.

The absence of fires of course prevents the hard baking of the soil into bricks.

(*b*) Were humus present, naturally there would be a better seed bed and one too from which the seeds would bear less chance of being washed away at the first burst of the monsoon, as is too often the case. Fire-protection does tend to prevent this washing away of the seed; but my reason for making this statement is a different one to Mr. Slade's, with whom I totally disagree about the formation of humus, at least as far as the Prome Division is concerned. Fire-protection prevents the leaves, grass, &c., being burnt, and as they are not eaten and worked into the soil until after the first burst of the monsoon, the seeds find a lodging amongst these leaves, grasses, &c., and are retained, and germinate even under a thick canopy of bamboos (*vide* second quotation from Western Circle Report quoted at the beginning of this memo). Outside fire-traced areas the soil is baked hard and the leaves, &c., burnt; the sequel is that the first rain rushes down, bearing most of the seed before it into the nullahs, as it finds no lodging except here and there in depressions and cracks in the soil; hence most of the seed is lost.

(*c*) I agree with Mr. Slade's remarks under this subhead.

(*d*) Ditto.

It is a very noticeable fact in this division, that, outside fire-traced areas, where the canopy is very light owing to the jungle being yearly burnt over, the natural regeneration of teak is better than in the fire-traced areas. Again, inside such areas regeneration of all light-demanding species, such as teak, *pyinkado* (*Xylia dolabriformis*) and cutch, is infinitely better in *myinwa*, (*Dendrocalamus strictus*) which flowers sporadically, than in *kyathaung* (*Bambusa polymorpha*) forest, where the shade is denser and the light is not let in by sporadic flowering.

The significance of this is emphasized by the fact that *kyathaung* grows on moister and better soil than *myinwa*, where the seedlings would have, *cæteris paribus*, a better chance of flourishing.

(*e*) I agree with the first part of this subhead; with reference to the last paragraph, however, I cannot agree. Cutch and *pyinkado* seedlings are very often, generally I might say, burnt down; but, they as a rule spring up again the next year, sending out stronger shoots than before. This is especially the case with cutch, though it is true, but to a less extent with *pyinkado*.

F. J. BRANTHWAITE.

II.—CORRESPONDENCE.

Lantana—the Forest's Friend !

I think "Velleda," though he jested on the subject of *Lantana* in your March issue, may like to read the annexed extract from the Coorg Annual Report for 1894-95. Mr. Lawrie effectually disposes of the "Forester's friend" theory, and clearly shows that, though *Lantana* "takes possession of the soil," it does not later on protect the young plants of valuable species as "Velleda" thinks.

It may interest your readers to know that in Berar, where the *Lantana* was an undoubted pest, steady work for three seasons at an expenditure of some Rs. 17,000 has practically eradicated the shrub, and all that is now needed is the destruction for a few years to come of seedlings and any plants overlooked in the first clearing. The expenditure in the future will be trifling, as one very satisfactory feature observed is the absence of shoots from roots left in ground, and the comparatively few seedlings observable after two years' careful work.

I may mention the fact that the Central Provinces Forest Administration has warmly supported Berar in eradicating *Lantana*, and has carefully destroyed any isolated shrubs found in Betul and Nimar. All these shrubs were apparently sown by birds which love the sweet fruit borne by *Lantana scandens*.

C. BAGSHAWE.

P. S.—May I warn your Bombay readers of the danger of introducing *Lantana* hedges. I hear this is being done in the little hill station of Panchgani, and I fear it is certain (as it did

in the case of Chikalda, which is much like Panchgani) to lead up to very insanitary conditions.

Extract from Coorg Forest Report, 1895-95, by A. E. Lawrie Deputy Conservator of Forests.

"I am sorry I cannot endorse the opinion of my predecessor regarding seedlings of *matti*, *biti* and *home*, found under impenetrable clumps of *Lantana*. One has only got to see a stretch of *Lantana* in all its glory, and it will not take long to find that these light-loving seedlings stand absolutely no chance. Even sandal itself cannot stand very thick *Lantana*. Lately I have had a few lines opened through dense *Lantana* where sandal had been sown some five years ago, and which were known to have germinated excellently, and for two years were not lost sight of, but in the third were completely covered over with *Lantana* and entirely lost sight of. In these lines, for every one weedy sandal nearly a hundred dry rotted stems were found from three to four feet high. *Lantana* as a nurse growing as a hedge no doubt is very good ; the stems if not burnt rise some feet up and then curve down on either side, allowing a fair amount of side light to reach any seedling springing up under it, and here the seedlings shoot a head protected from cattle and other animals. The other great drawback to *Lantana* and which makes it anything but the Forester's friend is in the matter of fires ; for once a fire enters a *Lantana* stretch the entire area is bound to be gutted. In any case, if it can be prevented, *Lantana* should not be allowed to take unlimited possession of the ground.

A Departmental Blazer.

No. 1.

The Departmental Blazer question, which has been under discussion for years would, I believe, be satisfactorily settled by a Committee of Forest officers sitting at Dehra. If this proposal meets with your approval, I would suggest that a notice be inserted in the *Forester*, asking for ideas from individual or local committees, up to the date on which the Committee will sit to decide the question. Personally, I approve of the colors mentioned by C. F. E., *viz.*, dark green and crimson, but I do not agree with him that a narrow stripe of pale blue is preferable to one of white, I have tried both, and think the latter looks the best.

Some may prefer a plain colored blazer; in that case I think a *very* dark green cloth, piped with crimson silk and with the monogram I. F. S. in crimson on the pocket and cap, would look well. I enclose painted patterns, No. 1 is for the striped blazer. The smaller paintings are suggestions for the ribbons to be worn with the plain green.

A. J. PORTER.

No. 2.

I have read with great interest the recent letters on this subject in the *Indian Forester* by G. E. M., "Velleda," and C. F. E. If I remember rightly, some years or so ago correspondence under this head was started in your pages, but through, I must conclude, lack of interest on the part of members of the service, was allowed to die an unnatural death. It is to be hoped that before this latter event again occurs, some understanding towards definitely settling the colours of the I. F. S. will have been come to.

In the letters under the abovementioned initials and *nom-de-plumes* the following proposals have been made :—

G. E. M., in the *Forester* for January 1896, writes:—"If one 'blazer cannot be found to suit the wishes of every body, why 'should not each Presidency have its colours ?"

"Velleda" in the *Forester* for March 1896, writes :—"I think 'we ought to have a blazer for all India and not separate ones for 'each Presidency." And also, after suggesting some colours, he writes :—"Failing this (the colours suggested) the only practical 'course is to appoint a committee of one or more from each Pro-'vince."

C. F. E., in the *Forester* for June 1896, agrees with both the above-quoted proposals of "Velleda" and in addition says:—"Each 'Province might make its suggestions in the pages of the *Forester*, 'the proposals might then be put to the vote and the choice of the 'majority adopted."

I think I am correct in stating that this is about the position of affairs at the present moment, and what is now wanted is some workable plan which will enable the colours to be settled to the satisfaction of each Presidency, Province, &c., and therefore of the I. F. S. as a whole.

I think the plan suggested by C. F. E., that each Presidency, &c., should discuss the question in the pages of the *Forester* rather hard on the Honorary Editor, whose work would thereby be greatly augmented ; it should also be borne in mind that the *Forester* is perused by a number of people outside the Department who could not be expected to take a great interest in long articles on the subject of the prospective wearing apparel of the service, or to care whether it is to be represented in future at tennis parties in pea-green or strawberry red.

I would state that I entirely agree with the proposals made by "Velleda," and endorsed by C. F. E. It is almost incredible to read that there is supposed to be insufficient *esprit de corps* in the service to enable it to settle upon a blazer and colours for the Department as a whole.

I submit the following proposals for consideration :—

1. That a Committee be formed of one or more members of the service from each Presidency, Province, &c. (as proposed by "Velleda") to be presided over by the Honorary Editor of the *Indian Forester*.

2. That the President (as the most likely person to know the men in each Presidency who take an interest in this question) should choose one or more men from each Presidency, &c., to form this Committee.

The Committee not to exceed say fifteen, excluding the President.

3. That the President request the members of the Committee (when formed) to submit a circular to their respective Presidencies setting forth certain designs for I. F. S. colours, to be drawn up by the members themselves, and to obtain the votes of all the members of the service in their respective Presidencies on them. The colour with the largest number of votes in each Presidency, &c., to be the colour chosen by that Presidency, &c. If a tie occurs the Committee member to settle it with his vote.

4. That the colours thus chosen by the different Presidencies, &c., be forwarded by the members of the Committee to the President.

5. That the President, on receipt of the different sets of colours, circulate them amongst the members of the Committee and get their votes on them. The colour with the largest number of votes to be called the I. F. S. colours for all India and to be used by that service alone. In the event of a tie between any two or more colours, the President's casting vote to settle the matter.

6. That the President as Honorary Editor be asked to keep the service informed from month to month in the pages of the *Forester* as to how matters are progressing.

Some such plan as the above should, I think, be taken in hand for the settlement of the question. I understand that the new Civil Service colours were settled off-hand by *one* member of that service, and there is much discontent in consequence, especially as it would be difficult to call the blazer a handsome one.

I quite agree with "Velleda" in his definition of a blazer. A plain coat with trimming is not, in the accepted sense of the term, a 'blazer.'

I submit herewith a few designs for I. F. S. colours taken from a number very kindly prepared for me by a friend, you will see the crimson green and pale blue proposed by C. F. E. amongst them, but I cannot say I care for the combination myself. I send a design for the pocket of the coat which I have prepared. It looks well, I think, but opinions of course are likely to differ.

In conclusion I hope that before many more issues of the *Forester* see the light of day, the I. F. S. colours may be *un fait accompli*.

An alternative plan suggested to me by a member of the service in this Presidency was that several of the leading firms should be asked to send in designs for I. F. S. colours with the promise that the firm who sent in the best, *i. e.*, the one chosen, should have the monopoly of the supply of the blazer, &c. The

above suggested plan of the Committee would still hold good, their only work being to decide between the different colours supplied by the firms. Personally, I prefer my above suggested proposals, as then, at any rate, we shall have colours chosen by a member of the service, though, of course, it will mean more work for the Committee.

E. P. S., BENGAL.

NOTE.—The patterns received from both our correspondents cannot, unfortunately be reproduced, but can be shown to any one who may apply for them —Hon. Ed.

III.—OFFICIAL PAPERS & INTELLIGENCE

Change in the Official designation of the Forest Service.

The following Circular has been issued by the Government of India :—

"Under existing orders and practice, that branch of the Forest controlling staff which is to be recruited in India is known as the Provincial Service, and the branch which is to be recruited from England as the Indian Service; while the few officers who serve more or less directly under the Supreme Government are included in what is known as the Imperial List.

"2. This nomenclature conflicts with that adopted in other Departments of the Public Service, in which the terms Imperial and Provincial are used to distinguish between the two main branches into which the particular service has been divided, and is constantly the cause of confusion.

"3. The Government of India have, therefore, decided that the two branches of the Forest controlling staff which are to be recruited in India and from England respectively shall in future be known as the Provincial and the Imperial Services; while the list on which Conservatorships and certain other appointments are borne shall be designated the India List. The Forest Code will be amended accordingly at the first convenient opportunity.

Proposed new arrangements for the selection of Recruits for the Burma Provincial Forest Service,

The following correspondence has been circulated for opinion among Conservators :—

From—The Revenue Secretary to the Chief Commissioner of Burma,

To :—The Director of the Imperial Forest School, Dehra Dun.

"I am directed to invite a reference to the correspondence ending with this office letter No. 77—1-F.-1, dated the 4th September 1895, regarding the supply of candidates from Burma for admission to the Dehra Forest School.

"2. In 1894 the Chief Commissioner decided to recruit five rangers a year from Dehra Dun in order to have men fit for promotion to Extra-Assistant Conservators when the Provincial Forest Service is enlarged. The system hitherto has been that any one who wished to go in for the Forest Ranger's course applied to a Conservator for a nomination. This Administration offered five stipends a year to candidates ; but it has hitherto been the case that less than five candidates nominated by Burma Conservators have been able to pass the entrance examination, and consequently all who have passed have got stipends,. The stipends not taken up in Burma were to be given to candidates recommended by you. Thus in 1894 we gave one to Mr. Wrafter.

"3. In 1895 only two candidates from Burma passed the entrance examination, and you were asked to recommend three more. In your letter of 19th July, you proposed that instead of subsidizing three scholars the money should be utilized in employing as rangers two passed students. Your proposals were supported by Mr. Hill and were agreed to by the Chief Commissioner

"4. The candidates who entered the School in 1894 have now undergone their final examination. Two of the stipendiary students from Burma have failed. Two others and Mr. Wrafter, who was taken from elsewhere, have succeeded.

"The Chief Commissioner has consulted the Conservators as to the advisability of continuing the present system. He agrees with them in considering that the system of giving scholarships to practically any one who applies does not give an adequate return for the outlay. Such stipends are probably necessary for Burmans, who would not go to Dehra Dun without them, but in other cases the offer of such an inducement appears unnecessary. It is therefore proposed to cease to advertize in the Gazette that five stipends will be given in each year, at the same time intimating to Conservators and the Director of Public Instruction that they are at liberty to recommend any Burman for a scholarship. Other applicants would simply get nominations and be told that the rangers required for Burma would be selected after the final examina-

tions. Such selection should not, Mr. Smeaton thinks, be purely by marks. Such a method would probably result in introducing men not physically fit or otherwise not adapted for this province. To the selected lads the cost or part cost of their education might be repaid. The total cost is estimated at Rs. 1,057. It is suggested that Rs. 500 might be repaid on selection and Rs. 500 on assumption of charge in Burma. The Chief Commissioner will be glad of an expression of your opinion on the above proposal."

"From—The Director of the Imperial Forest School, Dehra Dun,

To—The Revenue Secretary to the Chief Commissioner of Burma.

"I have the honour to acknowledge receipt of your letter No. 500—1-F.-1 of 21st May 1896, and in reply to say that I (as well as the Deputy Director, Mr. A. Symthies) consider the new arrangements for the selection of candidates to be excellent and a great improvement on the plan hitherto adopted. They will have the very great advantage of giving the students much greater incentive to work hard, and will make it possible to be sure that the men appointed are really physically fit. I would, however, suggest that, as a good many eligible young men from other parts of India come to the School in the hope of passing and obtaining employment, especially in Burma, such of them as the Director may recommend as being socially and physically eligible might be permitted to have their names placed on the list of nominated candidates, and be eligible to compete for the vacant appointments at the final examinations. To the School, the new arrangements will do good, I am sure, as leading candidates to understand that their conduct and their physical powers are under observation, as well as their progress in their studies: and the liberal terms of refund offered by the Chief Commissioner to successful men ought to induce a better class to come forward.

"2. I quite agree with the Chief Commissioner in the opinion that the selection after the final examinations should not be only by marks, but that the physical strength of the candidates and their capability of standing the exposure of Forest work should also be taken into account. I would suggest, in reference to this that it will be well to authorize the Board of Control of the School, at their yearly session in Dehra, to decide which of the passed nominated candidates it recommends for appointment and in what order. As the Director is a member of the Board, he will be able to advise them from his personal knowledge of the candidates."

IV.—REVIEWS.

Annual Report on Forest Administraton in Travancore for 1894-95.

This is the Report for the M. E. year 1070, which ended on August 15th, 1895. The first point considered is the passing of the Rules required under the Forest Regulation. On these the Conservator says :—

"Until these rules were passed, the Regulation had little value, and the position held by Forest officers was very trying. The Regulation being inoperative the only way to keep a check on smuggling and other offences of a similar nature was to continue the old system of punishing by confiscation of the timber concerned, or by a fine, any breach of the Department rules that was reported. In many instances the order of confiscation was appealed against, and not unfrequently the conviction was reversed on the ground that it could not be upheld by law.

"The passing of the Forest rules has removed all this uncertainty."

There were no new areas proposed during the year for settlement, but the settlement of the Malayattur reserve of 345 square miles was completed. The total area under the Department was about 1,460 square miles. The demarcation is being done entirely with cut rides which are cleared every year, and so far no boundary marks have been erected. We fully agree that cut lines alone are better than boundary marks alone, but think that the best demarcation is a combination of the two. Working-plans have not yet been begun.

The establishment in Travancore consists of one Conservator, two Deputy and three Assistant Conservators, seven Chief Rangers and Sheristadars, 15 Forest Inspectors, 48 Amindars, and 236 Forest Guards; but the great want is said to be in trained Forest Rangers. We should think that if the funds are forthcoming, the complaint should be easily rectified with the help of the Forest School.

Fire-protection is being attended to, and the Conservator remarks as follows about it :—

"Owing to the long drought in the middle of the Malabar year, fires were much more frequent and more intense than they have been in former years. It is usual to see all the deciduous forests burnt year after year, but in 1070 fires occurred in evergreen forests as well ,burning the dry leaves and scorching many of the large trees. Such cases are very uncommon and testify to the severity of the drought. Some of the fires occurring in the evergreen forests were started by the subordinates of the D. P. W., who to save themselves the trouble of removing the dead leaves from the roads swept them into heaps and set fire to them. The

attention of the Divisional Engineer officers has been drawn to the serious damage caused by such a practice.

"Fires swept through portions of the teak plantations at Malayattur, Kong and Ariyancavu, although carefully fire-protected. At the first two named places the damage done was insignificant, because the fires occurred in the older plantations which had been kept weeded, and there was nothing for them to burn, the fire merely running along the surface of the ground among the dead leaves and dry grasses. At Ariyancavu the fire got into a three-year old clearing where there was a great deal of timber left unburnt at the time of planting. In all about 9 areas were burnt, but as the land was quite clear of weeds and undergrowth, only those trees suffered which were growing near dead timber."

The remarks on *Natural Reproduction* are interesting as usual. The Report says:—

"No special reports have been received this year as to the abundance or scarcity of the seeds of the different forest trees, but there can be little doubt that the long drought, at all events in some cases, though it may have caused a profuse flowering acted injuriously on the development of the fruits. My attention was drawn to this fact in the case of a species of *Hemicyclia*, the seeds of which I was anxious to get, but though it fruited abundantly in 1069, the whole of the seed crop in 1070 failed.

"Mr. Thomas, Assistant Conservator reports the finding of a large grove of *(Thumbagom) Hopea parviflora* saplings on the Perunthode and the same fact has been reported to me from Ariyancavu. I welcome such reports most heartily, for we cannot know too much of how the different species of trees grow, where they grow, and under what conditions they thrive best. I am calling the attention of all the officers of the controlling staff to this important subject, *i. e.*, the study of the distribution of species not only for their own personal efficiency, but that the general stock of information regarding our forests may be increased."

Under *Artificial Reproduction* about 162 acres of teak plantation are reported to have been made at an average cost of Rs. 37 per acre, the plants mostly 6 ft. by 6 ft. and 5 ft by 5 ft. The following are reported as the dimensions of the largest trees :—

	4 yrs. old	3 yrs. old	2 yrs. old	1 yr. old
Malayattur	...	...	33′ × 12½″ girth	17½′ × 53 ⅜″ girth
Konny	...	...	26′ × 11½″ ,,	...
Ariyancavu	40″ × 16″ girth	33′ × 14½′ girth	24½′ × 10½″ ,,	...

The girth was taken at 4½ feet from the ground.

The plantations have had to contend against enemies in the shape of fires, floods, winds and insects, as the following extract shows.

"A fire destroyed and damaged some thousands of plants in the 36 acres at Ariyancavu (planted in 1068), but those trees which had been burnt without being killed were cut down and the shoots have made good growth. To replace the trees completely killed, 8,000 plants were put down.

"At Malayattur a high flood at the commencement of the monsoon submerged and killed some 500 teak trees which had been planted in too low a situation. Their places have now been supplied by an equal number of *Thumbagom* plants (*Hopea parviflora*) which species delights in moisture.

"The high winds which ushered in the monsoon bent over many of the 2-years old saplings in all three places, young trees at that age being very susceptible to damage of this kind; but judging from past experience we may be confident that the greater number will recover. Caterpillars did some damage at Malayattur and Ariyancavu by eating the leaves of young trees in the dry weather."

About Rs. 9,135 were spent in works of improvement, including elephant cages."

The *financial results* of the year were :—

	Rs.
Revenue	6,28,788
Expenditure	2,78,310
Surplus ...	3,50,478

which seems very good and warrants a more efficient establishment.

The Travancore Forest Department seems to be well managed under the Conservator, Mr. Bourdillon, and we wish it all success.

VI.—EXTRACTS, NOTES AND QUERIES.

Dr. Schlich's Manual of Forestry, Vol. iii.

(*From "Nature."*)

Part iii deals with working-plans; and this portion of the book cannot be sufficiently recommended to forest proprietors in Great Britain. In the first volume of his manual, Dr. Schlich justly drew attention to the large importation into the United Kingdom of timber and other forest produce, and he estimated that £12,000,000 a year represented the value of oak, birch, coniferous and other woods imported from abroad, that might be produced in Great Britain. This was in 1889; it was a cautious estimate, and since it was made, imports into the United Kingdom have increased steadily.

Landed proprietors in Great Britain have fortunately not yet suffered to the same extent by the decline in the price of wheat and other agricultural produce, as proprietors in some parts of Germany. Yet their income has diminished, and in many cases it doubtless would be desirable to increase that income

Much might be done in this direction, if the management of existing woodlands were improved, and if land which it does not pay to keep under the plough, or to convert into grass land, were planted up and converted into forest. One objection commonly raised to this proposal is, that timber traders prefer imported to home-grown timber. That this is the case there is no doubt, and in the preface to the present volume Dr Schlich explains the reason. Home-grown timber, cannot, as a rule, compete with imported timber, because it has not grown up in dense compact masses. The woods are open, hence the bole is short branched, and knotty. There are exceptions, but open park-like woods are the rule, and these cannot be expected to yield timber of good quality. A different system of sylviculture must be adopted. Of greater importance still is the adoption of a regular system of management. Timber of different kinds and of the exact qualities required by the market is imported regularly in sufficient quantities at the principal ports of the United Kingdom; the timber trader is able to make the needful arrangements to supply his customers, because he is certain that whatever he may require to meet their demands, will be available at the right time. Home-grown timber, on the other hand, is thrown upon the market in an irregular fashion. All at once heavy cuttings are made at once place, to provide money, or for other reasons, and then perhaps nothing is cut in the same district for years to come. The necessary consequence of such a system, or rather want of system, is that the timber is not sold at its full value. And when a calamity occurs, such as the storm of 1894, the timber blown down cannot be sold, except at ruinously low rates. The only remedy is the adoption of methodically arranged working-plans in all forest tracts throughout the country. Among other things such working plans determine the annual yield of each forest district. It does not follow that the yield once fixed must be pedantically maintained. A good working-plan is elastic, and permits deviations to suit the interest of the proprietor. But if a methodical system of working is the rule in all forest districts, these deviations will generally compensate each other, and the market will nevertheless be regularly supplied.

What, then, is a working-plan? The German term is Wirthschafts plan, and the English term (working-plan) was first used in 1856 when the writer of these lines commenced to work the Pegu teak forests on a regular system. The number of teak trees of the different age classes was approximately determined by an elaborate system of valuation surveys. It was found that the trees of the second-classes were sufficiently numerous to take the place of first-class trees, and that the same was the case with the younger classes. It was ascertained, that twenty-four years on an average would be required for the trees of the second-class to attain first-class size. The result was that the removal of the first-class trees, those which were fit to yield marketable timber, must be spread over at least twenty-four years; and upon this very

simple principle, a working-plan, intended to provide, in the first instance, for six years only, was established for the different forest districts. After the expiration of the first six years, this plan was renewed, and subsequently modified and elaborated in detail. The principle, however, has been maintained to the present day. These are the bare outlines of the scheme, which has not only ensured a sustained yield, but, and that is very important, has been readily intelligible to all.

The working-plan of coppice woods is a simple matter. The area is divided into as many compartments as there are years in the rotation. If the coppice is cut, when it has attained the age of fifteen years, fifteen compartments are formed, and every year the old wood on one compartment is cut, after which the coppice shoots grow up to form the new crop. The rotation is determined by the species composing the coppice, and the class of material required, and the yield depends upon the areas cut over, which are equal, where the quality of the locality is uniform, unequal in inverse proportion to the quality, where the quality varies.

In the case of high forests, matters are more complicate, and a brief indication of the main subjects that must be attended to, may serve to explain what is done. A thorough examination of all portions of the forests, its previous treatment, soil, climate, and other conditions, which influence the growth of trees, an accurate and detailed survey of the growing stock, and, lastly, the market for timber and other produce, and the labour available for forest work, are the points which must be examined in the first instance. The next subject is the study of the lines of communication, roads, and water-courses to be used for the transport of timber ; and, lastly, the subdivision of the forest into blocks and compartments. A forest to be manageable must consist of compartments of moderate and fairly uniform size. On level ground regular rectangular figures are most convenient ; in a hilly country, compartment boundaries must follow the configuration of the ground. Obviously it is in every respect convenient that, wherever practicable, compartment boundaries should coincide with export roads ; the sooner, therefore, a system of roads is projected and traced on the ground the better, the traces serving as compartment lines, though the roads need not be built until cuttings are made in the com partments adjoining them.

Simultaneously with the division of the forest into blocks and compartments, the method of treatment must be considered, the choice of species, and the sylvicultural system, particularly with regard to the regeneration of the forest, and the arrangement of cuttings. Large forest areas will generally have to be divided into several working sections, each with its own system of treatment—say one working section for coppice woods, another for coppice under standards, a third for high forest of spruce or Scotch pine, worked on short rotations, with clear cutting and planting ; others, again, for high forest worked on a long rotation, under the selection, and shelter-wood compartment systems.

Two prominent points to be settled in a working-plan are to determine the rotation and the annual yield. As regards the rotation—that is, the age at which the timber should be cut—the requirements of the market must be consulted in the first instance. It has already been mentioned, that where pit-props find a ready market, coniferous woods may profitably be grown on a short rotation of 50 to 70 years. Where building wood of moderate dimensions pays best, a rotation of from 80 to 100 years will be more profitable. Oak timber, on the other hand, takes a long time to attain a marketable size, and afterwards, with advancing age and increasing diameter, continues long to increase in value. Where it is intended to regenerate forests by self-sown seedlings, trees must of course be allowed to attain that age at which they bear good seed in sufficient quantity; nor must they be allowed to remain after the production of good seed has diminished.

These considerations follow as a matter of course. A more difficult question is, within these limits, to decide upon the most suitable rotation. It might be thought that the simplest plan would be to divide the total income expected during the rotation, less the expenses incurred, by the number of years in the rotation, and to select that which gives the largest mean annual net income. Adopting the data given on page 513, which represent the growth of a Scotch pine forest on land of middling quality, the mean annual net income under a rotation of 80 and 100 years would be as follows :—

$$\frac{2225 + 4 + 36 + 67 + 86 + 91 - (60 + 3 \times 80)}{80} = 27{\cdot}61 \text{ shillings.}$$

$$\frac{3376 + 4 + 36 + 67 + 86 + 91 + 95 + 94 - (60 + 3 \times 100)}{100} = 34{\cdot}89 \text{ ,,}$$

Under this mode of calculation, which takes no account of interest, the mean annual net income increases with the length of rotation, and this increase continues until volume and value-increment become so much reduced that they will no longer cover the increased outlay. This result, however, does not agree with what has previously been explained. If, as ought to be done, interest is taken into account, a rotation of 80 years is that which, in the case here assumed, yields the highest net rental, and is hence financially the most profitable.

The rotation to be adopted is, it may readily be imagined, a fertile subject of controversy, which often gives rise to animated discussions among foresters in Germany. The author is in favour of what is commonly called the financial rotation, under which the forest capital (soil and growing stock) yields the highest interest, and under which, as explained above, the soil expectation value and net soil rental culminate. But Dr. Schlich justly observes that purely financial interests must in many cases be modified by considerations of a different character.

How the annual yield, that is, the timber which may be cut annually or within certain periods, is determined in the case of coppice woods, has already been indicated. In the case of high forests, three different systems are generally followed. The first of these the author designates as the allotment of woods to the different periods of a rotation, A rotation of 80 years is divided into four periods of 20 years each. It will serve to make matters clear, if we assume the existence of a normal forest with an even distribution of age classes. To the first period would be assigned in such a forest all woods between 61 and 80 years, to the second those between 41 and 60 years, and so on, so that the fourth class would comprise the youngest woods under 20 years. Such a regular forest, however, does not exist, and what in reality is done, is to assign the oldest woods to the first period, and to distribute the others according to their age, as well as can be done. A number of compartments, stocked with old timber, are thus assigned to the first period, and care is taken to allot to each period approximately equal areas, which if there are great differences in the quality of the locality, are reduced to a common standard. The woods placed in the first period are then measured, their volume calculated, and the increment for half the number of years in the period is added. The total volume divided by 20 gives the mean annual yield during the first period. The cuttings in the woods assigned to each period are arranged so as to suit sylvicultural requirements and economic considerations. The allotment of compartments to periods can obviously be made by volume instead of by area. In that case old woods are measured, and the proper increment added. For younger woods the volume, which will stand on the ground at the time of cutting, is calculated from yield tables. Equal volumes are assigned to each period, the oldest woods being allotted to the first, and the youngest to the last period. The compartments allotted to one period, whether by volume or by area, will not necessarily be contiguous; they will often be scattered over the whole forest. Whether the allotment to periods is regulated by area or by volume, a framework must be constructed, showing during which period each wood is to be cut. Hence this system is commonly known as the framework system. However irregular the forest may have been; at the end of the rotation its condition will approximate to the normal state. Thus the system introduces order, and is yet elastic, leaving sufficient latitude in the location of cuttings during each period.

The second system regulates the yield according to increment and growing stock. The legitimate yield of a forest during a given period in the first instance depends upon the quantity of timber produced during that period. During one year more should not, as a rule, be cut than the quantity represented by the sum total of the annual increment laid on in all portions of the forest. In a normal forest, with a regular succession of age classes, the legitimate annual yield is equal to the annual increment. In a

forest, however, which, though well stocked, only contains the younger age classes, the produce of which is not marketable, no yield is possible, though the annual increment may be considerable. Again, in a forest where the older age classes preponderate, it is not only permissible, but it is in most cases necessary, to cut considerably more than the total annual increment. This principle has long been recognised, and as early as 1788 the management of the Austrian State forests was based upon it. When the older age classes preponderate, it is proper to fix a period, during which the surplus old growing stock shall be removed. If this period is called a, and I the actual annual increment, then the legitimate annual yield of the forest is :—

$$= I \times \frac{\text{actual growing stock} - \text{normal growing stock}}{a}$$

This, which is known as the Austrian assessment formula, is still used in many public and private forests of Austria and Germany. Space forbids further discussion of this and similar methods. Suffice it to say that under this system no framework is needed, and that on this principle it is best to determine the yield for a short period only. Hence in those forests, where this system has been adopted, the yield is generally determined for ten years and at the expiration of this time a new working-plan is made.

The third system, which is in force in the State forests of Saxony, was originated by Cotta in 1811, and has been brought to its present state of perfection by Judeich, for many years until his death in 1894, Director of the Tharand Forest School, one of the ablest foresters of Germany. Its leading idea is to treat each wood, or each compartment, or each group of compartments, on its merits, the management of the whole forests representing a summing-up of the treatment laid down for each wood. It has already been stated that a large portion of the State forests in the Kingdom of Saxony are nearly pure spruce forests, managed on a very simple system by clear cutting and planting, and that most of them are worked on a rotation of 80 years. At first sight elaborate working plans might seem to be superfluous under these circumstances ; it might be thought sufficient if a suitable area of the oldest woods were cleared and planted annually. However, had the forests been worked in this manner, without safeguards against storms and insects, their condition would not be what it actually is, nor would the financial results be so satisfactory. Pure spruce woods are apt to be blown down. Spruce plantations are apt to be destroyed by the pine weevil, and it was to a great extent the necessity for guarding against damages from these causes which led to the development of the present system in Saxony. On the spurs and in the valleys of the Erzgebirge and the other mountainous regions of Saxony, where most of the State forests are, the direction of the prevailing winds, though generally westerly, is greatly modified

by the configuration of the ground. Accordingly the cutting series, in which all clearances proceed against the wind, must be most skilfully arranged, so as to guard against damage. Again, in order to guard against the ravages of insects, the principle of breaks in the successive clearances has been consistently carried out. When in one spot a cutting has been made, the adjoining area is not cleared until the young wood on the first area has become completely established. The result consists in numerous cutting series, separated by severance cuttings, and numerous clearances of limited extent. An essential feature in this, as in the second system, is that the yield is determined only for a period of 10 years. The woods proposed for cutting during that period are carefully examined. According to Judeich's plan, the question whether a wood should be cleared is determined by purely financial considerations. Dr. Schlich, however, very properly urges that other considerations also should have due weight. Obviously a regulator is necessary, to prevent too large an area being assigned to one period. This regulator is obtained in a very simple manner. The total area is divided by the rotation. For a forest of 2,400 acreas, worked under a rotation of 80 years, 300 acres would be the area cleared during a period of 10 years.

The system here sketched is simple and effective, but, like all systems, the results depend upon the manner in which it is worked. The young woods must be complete and vigorous, and though the outlay in forming them is multiplied seven-fold in 80 years under the operation of compound interest, even at the low rate of 2½ per cent., undue economy in this first operation, and in the subsequent tending of the woods, would result in waste and diminished net revenue from these magnificent estates.

Thus far the management of forests has been discussed, as if timber were the only legitimate forest produce. This, however, by no means is the case. Large plantations have been made in Assam by the Forest Department, ever since 1870, of *Ficus elastica* for the production of indiarubber. Myrobolams, the fruit chiefly of *Terminalia chebula*, is an important article of forest produce in Western and Central India. The Scotch pine forests which surround the old town of Nürnberg, are important, less on account of the timber which they produce, than because the annual fall of needles furnishes litter to the peasants in the vicinty, who chiefly depend upon the growth of vegetables, and who use the dry needles as a substitute for the straw which they do not produce. In the drier regions of India, a commencement was made in 1874 to protect woodlands for the specific purpose of furnishing cattle fodder in times of drought. Had these attempts been carried on with sufficient vigour and perseverance, they might have contributed largely to mitigate the sufferings of the agricultural population during seasons of deficient rainfall, which in most parts of the Indian Empire occur from to time.

Other articles of produce obviously demand other system of management. With these, however, forest proprietors in the United Kingdom at present have no concern. Their interest is to produce timber of the best description, and to sell sufficient quantities to attract purchasers at regular intervals. A beginning can only be made by actual experience. Should any proprietor have the courage and foresight to ask the author of the manual here reviewed, or any other really competent and experienced forester, to take in hand his forest estates, and to organise their management on a well considered plan, the result would certainly induce others to follow suit. In a matter of this kind example is better than teaching, and the sooner a commencement is made the better for the landed interest of Great Britain. Patience, however, and plodding perseverance, are indispensable conditions of success in forestry. Timber takes many years to attain marketable size, its growth in volume and value is slow, and the money returns are moderate. These are the chief reasons why systematic forestry is not yet respected in Great Britain. In this, as in other matters, the pressing needs of the moment stand in the way of undertakings which would, slowly but surely, advance the future welfare of the country.

D. BRANDIS.

Sleepers for Ceylon Railways.

The creosoted Baltic fir sleeper, with which our railways are principally laid, is a more satisfactory sleeper, as regards length of life and first cost, than the native hardwood sleeper. The former, notwithstanding having been first imported from the north of Europe to England, and, after sawing and creosoting, again shipped to Ceylon, cost only Rs. 3·30 each, whereas the native hardwood sleeper grown in our forests, and supplied to this Department, cost, without creosoting Rs. 4 each, and their respective average lives are as eight to five. The defect in the Ceylon native wood sleeper is "dry rot," the only exception being satinwood and malilla, neither of which is now obtainable for sleepers. I have tried na (ironwood), palu, kahata, mi, doon, and many other Ceylon timbers, some of which had to be taken out of the road after eighteen months, owing to dry rot, while others have lasted as long as five to seven years.

Of Rs. 10,000 hardwood sleepers supplied for the construction of the Bentota extension, at Rs. 4 each, and said to be "doon," there is not one in the road now, some of them were completely rotten in twelve months, and out of the whole number none had a life of five years.

We shall always require hardwood sleepers for our sharp curves, owing to their greater resistance to crushing, and giving a better hold for the fastenings. Australian hardwood sleepers have been tried, *viz.*, red and blue gum and karri. The former had a

life of from twelve to fifteen years; the latter has not been long enough in the road to fairly judge of its life as a sleeper.

I have not had an opportunity of trying the Australian "iron bark," but from the fact that iron-bark sleepers are now being shipped to England in large quantities, I would infer that they are both fairly cheap and have a good reputation.—(*Ceylon Forester.*)

Forest Fire Legislation in the United States.

It is admitted by all who have studied the needs of forestry in this country that no application of rational forest management can be expected until forest property is better protected against fire.

Circular No. 10 of this Division stated the principles that must underlie effective forest fire legislation, and has, it is believed, been influential in shaping the measures which were enacted in Wisconsin and Minnesota during the past year. The object of the present circular is to call attention to these more recent forms of legislation and to briefly summarize all existing acts in force in the different States for the protection of forests from fire.

The *Minnesota* law, which is modelled after the New York and Maine laws—pioneers in rational forest fire legislation—is believed to be the most complete, and has been quoted entire, the provision of the Maine law being given at some length. All of these recognise the necessity of intrusting the enforcement of the law to some responsible officer. It is hoped that other States will find both incentive and assistance in these advanced measures for the revision of their own forest fire legislation.

The Minnesota law is as follows:—

AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND PRAIRIE FIRES.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The State auditor shall be forest commissioner of this State, and his orders shall be supreme in all matters relating to the preservation of the forests of this State and to the prevention and suppression of forest and prairie fires as hereinafter provided. The supervisors of towns, mayors of cities, and presidents of village councils are hereby constituted fire wardens of their respective towns, cities, and villages in the State, and the chief fire warden may appoint as fire wardens such other persons as he may deem necessary living in or near to unorganized territory in this State, whose districts, to be known as fire districts, he may determine.

SEC. 2. The aforesaid forest commissioner shall appoint a competent deputy to be known as chief fire warden, who, from personal experience, is familiar with the conditions of the forest and methods by which fires may be controlled. Said chief fire warden shall receive a salary of twelve hundred ($1200) dollars per year, and shall hold his office during the pleasure of the forest commissioner. He shall represent the authority of the forest commissioner, and it shall be his duty to enforce the provisions of this act throughout the State.

SEC. 3. The chief fire warden shall have general charge of the fire warden force of the State, and shall have authority to mass such fire warden force as may be available at any special point to suppress fires. In case the fire warden force of any locality is deemed by said chief fire warden inadequate to prevent or suppress forest or prairie fires he may appoint temporarily needed fire wardens, whose duties and authority shall be the same as herein given to town supervisors acting as fire wardens. He shall properly divide into fire districts all unorganized territory in this State and appoint competent fire wardens therein; he shall cooperate with any police or military force of the United States Government which may be detailed to guard the national domain from fire; he shall investigate the extent of the forests in the State, together with the amounts and varieties of the wood and timber growing therein, the damages done to them from time to time by forest fires and the causes of such fires, the method used, if any, to promote the regrowth of timber, and any other important facts relating to forest interests which may be required by the forest commissioner. The information so gathered, with suggestions relative thereto, shall be included in a report to be made by him annually to the forest commissioner.

SEC. 4. The forest commissioner shall provide and officially sign an abstract of the penal laws of this act, with such rules and regulations in accord therewith as he may deem necessary, and on or before the first day of April of each year he shall forward as many copies as he considers needful to the chairman of each town board of supervisors and presidents of villages, to the forest fire wardens that he has appointed and to all railroad companies and to the chairman of each board of county commissioners in this State, and it shall be the duty of said fire wardens to post up such abstract as warning placards in conspicuous places in their respective districts, and it shall be the duty of the country commissioners of each county to cause the said abstract to be published in at least three issues of the official paper in their respective counties during the fire-dangerous season of each year, which shall be reckoned from the 15th of April to the 1st of November.

SEC. 5. During a dry and dangerous season, when forest and prairie fires are prevailing or are liable to break out, the chief fire warden shall use such means under his command as he may deem necessary to prevent or suppress such fires, and his expenses shall

be paid by the State, which expenditures in one year shall not exceed five thousand dollars, to be paid for out of the general revenue fund, upon the order of the forest commissioner.

SEC. 6. It shall be the duty of each fire warden to take precautions to prevent the setting of forest or prairie fires, and when his district is suffering or threatened with fire, to go to the place of danger to control such fires, and each forest fire warden shall have authority to call to his assistance in emergencies any able-bodied male person over eighteen years of age, and if such person refuses, without reasonable justification or excuse, to assist, or if any fire warden refuses or neglects to perform the duties assigned him in this act, such officer or person shall be deemed guilty of a misdemeanor, and shall upon conviction thereof be punished by a fine of not more than one hundred ($100) dollars or imprisonment in the county jail not to exceed three (3) months.

SEC. 7. The chief fire warden and the several fire wardens created by this act shall have authority to enforce the provisions of this act, and it shall be their duty to cooperate with the fire warden of any adjoining district, and in the absence of such fire wardens to direct the work of control and extinguishment of forest or prairie fires in such district, and to arrest without warrant every person violating any provisions of this act, and to forthwith take the offender before a magistrate and make complaint against such person. The chairmen of boards of township supervisors, presidents of villages, and fire wardens appointed by the chief fire warden shall inquire into the cause of each forest or prairie fire within their districts and shall report the same to the chief fire warden and the methods used to control or extinguish such fires and the amount of property destroyed and the number of lives lost, if any, and report such other facts in regard to said fires as said chief fire warden may require. During the more dangerous season of the year the chief fire warden may require frequent reports from the chairmen of township boards, or in unorganized towns from fire wardens appointed by the said chief fire warden as to condition of forest and prairie fires and as to what is being done to control the same.

SEC. 8. Each fire warden shall receive for his actual services rendered under this act two ($2) dollars per day, two-thirds of which shall be paid by the county where such service is performed, and one-third by the State; and any employee engaged in like service shall receive at the rate of one and fifty one-hundredths ($1.50) dollars per day, and said expense shall also be paid, two thirds by the county where such service is rendered, and one-third by the State, as hereinafter provided, but no payment shall be made to any claimant under this act until he shall have presented an itemized account and made oath or affirmation that said account is just and correct, which account shall be approved by the board of township supervisors, and shall be audited by the county commissioners, when satisfied of the justice of the claim, and left on file with the county auditor; in case of unorganized town-

ships, the board of county commissioners alone shall approve and audit such accounts. The county auditor shall thereupon issue to each claimant his warrant upon the county treasurer for the entire sum to which such claimant is entitled, and the treasurer shall pay the same. Such county auditor shall transmit the original oath and copy of the warrant to the State auditor, who shall audit such claim, and one-third thereof shall be paid out of the State treasury from the general revenue fund by warrant issued by the State auditor upon the State treasury in favor of the county thereof paying the same, and forward the same to the auditor of said county: *Provided,* That no fire warden shall be paid, in any one year, for more than ten (10) days' service in extinguishment and preventing forest or prairie fires, nor for more than five (5) days' service in each year in posting notices and making the reports required by this act; nor, in the aggregate, for more than fifteen (15) days' service of whatever character, in any one year; nor shall any one person employed by fire wardens to assist in extinguishing or preventing forest or prairie fires be paid for more than five (5) days of such service in any one year. No county shall expend more than five hundred ($500) dollars of public money in any one year under this act.

SEC. 9. Any person who wilfully, negligently, or carelessly sets on fire, or causes to be set on fire, any woods, prairies, or other combustible material, whether or not on his own lands, by means whereof the property of another is injured or endangered, or any person who wilfully, negligently, or carelessly suffers any fire set by himself to damage the property of another, is guilty of a misdemeanor and shall be punished by a fine not exceeding one hundred ($100) dollars, or by imprisonment in the county jail not exceeding three months. Any person who maliciously sets on fire, or causes to be set on fire, any woods, prairies or other combustible material whereby the property of another is destroyed and life is sacrificed, shall be punished with a fine of not over five hundred ($500) dollars, or be imprisoned in the State prison for a term of not over ten (10) years, or both such fine and imprisonment.

SEC. 10. Any person who shall kindle a fire on or dangerously near to forest or prairie land and leave it unquenched, or shall be a party thereto, and every person who shall use other than incombustible wads for fire-arms, or who shall carry a naked torch, fire brand or other exposed light in or dangerously near to forest land, causing risk of accidental fire shall be punished by a fine not exceeding one hundred ($100) dollars or imprisonment in the county jail not exceeding three (3) months.

SEC. 11. Every person who shall wilfully or heedlessly deface, destroy, or remove any warning-placard posted under the requirements of this act shall be liable to a fine not exceeding one hundred ($100) dollars for each such offense, or imprisonment in the county jail not exceeding three (3) months.

SEC. 12. It shall be the duty of all railroad companies operating any railroad within this State to use efficient spark arresters on all their engines and to keep their right-of-way to the width of fifty (50) feet on each side of the center of the main track cleared of all combustible material and safely dispose of the same within said limits of their right of way between the 15th day of April and the 1st day of December. No railroad company shall permit its employees to leave a deposit of fire or live coals, or hot ashes, in the immediate vicinity of woodland, or lands liable to be overrun by fires, and where engineers, conductors, or trainmen discover that fences or other materials along the right-of-way or woodland adjacent to the railroad are burning or in danger from fire, they shall report the same promptly at the next telegraph station that they may pass. In seasons of drought railroad companies shall give particular instructions to their employees for the prevention and prompt extinguishment of fires and they shall cause warning-placards furnished by the forest commissioner to be posted at their stations in the vicinity of forest and prairie grass lands; and where a fire occurs along the line of their road they shall concentrate such help and adopt such measures as shall be available to effectively extinguish it. Any railroad company wilfully violating the requirements of this act shall be deemed guilty of a misdemeanor and be punished by a fine not exceeding one hundred ($100) dollars for each such offense, and railroad employees wilfully violating the requirements of this section shall be guilty of a misdemeanor and be punished by a fine of not less than five ($5) dollars nor more than fifty ($50) dollars. But this section shall not be construed to prohibit or prevent any railroad company from piling or keeping upon the right of way cross-ties or other material necessary in the operation or maintenance of such railroad.

SEC. 13. It shall be the duty of each and every owner of thrashing or other portable steam engines to have efficient spark arresters on their engines at all times when in use, and no person in charge of any thrashing engine shall deposit live coals or hot ashes from his engine in any place without putting them out or covering them with at least three inches of earth before leaving them. All persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not less than five ($5) dollars nor more than fifty ($50) dollars.

SEC. 14. Nothing in this act shall be construed as affecting any right of action for damages.

SEC. 15. Woodland territory within the terms of this act shall be construed to mean bodies of forest and brush land.

SEC. 16 All moneys received as penalities for violating the provisions of this act shall be paid into the county treasury of the county wherein the offense occurred, to be known as the county fire fund, and used under the direction of the county board in

defraying the expenses of enforcing the provisions of this act within such county.

SEC. 17. The forest commissioner shall annually on or before the first day of December make a written report to the governor of his doings in respect to the duties herein assigned him, together with an itemized account of the expenses incurred in carrying out the provisions of this act, which report shall include such statistics and facts as he has obtained from the chief fire warden and from the several fire wardens of the State and from other sources, together with his suggestions relative to the preservation of the forests of the State and to the prevention and extinguishment of forest and prairie fires.

SEC. 18. All acts and parts of acts inconsistent with this act are hereby repealed.

SEC. 19. This act shall take effect and be in force from and after its passage.

Approved April 18, 1895.

The *Wisconsin* law (Chapter 266, Laws of 1895) is similar in general character to the Minnesota law, except that the chief clerk of the State land office and his deputy are made State forest warden and deputy forest warden, respectively, without additional salary. Towns are limited to $100 per year expenditure in extinguishing fires.

The *Maine* law (Chapter 100, Public Laws of 1891) makes the State land agent the forest commissioner. The selectmen of towns are made fire wardens and their duties are to post copies of the law in conspicuous places, and to superintend the work of extinguishing fires. They are empowered to call upon any person for assistance, and a refusal makes the party liable to $10 fine. The county commissioners in counties where there are unorganized places may appoint not to exceed ten fire wardens. No town shall expend, for extinguishing fires, more than 2 per cent. of its valuation for purposes of taxation. Anyone who neglects to extinguish a camp fire is liable to a fine not exceeding $100 or imprisonment in the county jail for one month, or both. Non-combustible wads must be used by hunters. Municipal officers (and county commissioners in unorganized places) shall make strict inquiry into the causes of fires within wooded lands, and prosecute the offender without delay. Town selectmen shall, where a forest fire of more than one acre has occurred, report to the forest commissioner the extent of fire and amount of loss, and the measures found effective in subduing fire, for which purpose blanks shall be furnished by the forest commissioner.

Railroad companies are required to have their employees burn or cut and remove all grass, etc., from their right-of-way once a year, to use spark arresters on their locomotives; to refrain from depositing live coals, fire, or ashes on their track; and to report fires along right-of-way at the next stopping place that is a telegraph station. Railroad companies are held liable

for all damage to forest growth by any person in their employ during road construction. During construction of such roads through woodlands, abstracts of the laws relating to forest fires shall be posted along the roadway at distances of 200 feet. Anyone so employed who fails to extinguish a fire made by him is liable to a fine not exceeding $500 or imprisonment not exceeding sixty days, or both, and it is made the duty of all persons having charge of men in such railroad construction to see that the provisions of this act are complied with, any negligence subjecting them to the punishment above named. Violations of this act by railroads are punishable by a fine of $100 for each offense. The forest commissioner shall encourage an interest in forestry in the public schools, and shall prepare circulars of information giving advice for the care of woodlands. He shall have copies of this chapter and all other laws of the State relating to forest fires printed and freely distributed to the selectmen of all the towns of the State, who shall post them up in schoolhouses, sawmills, logging camps, and other places, and to forest owners who may post them at their own expense. Anyone defacing or destroying such notices is liable to a fine of $5.

Colorado.—Chapter 54 [Mill's Annotated Statutes (1819)] creates the office of forest commissisner. The forest commissioner shall cause all woodlands owned by the State to be located and recorded, make and publish reasonable rules and regulations for the prevention of trespass upon said lands, for the prevention and extinguishment of fire thereon, and for the conservation of the forest growth. He shall, so far as possible, promote the gradual extension of the forest area, encourage the planting of trees, and preserve the sources of water supply, but shall not interfere with the use of timber for domestic, mining, or agricultural uses. On or before December 15, annually, he shall report to the governor his official action during the preceding year, and such information as may be useful in preserving the forest and maintaining the supply of water.

County commissioners and road overseers shall act as conservators of woodlands in their respective localities. They shall encourage the planting of trees along watercourses, irrigating ditches, and in other proper places, but shall incur no expense, except in cases of emergency, unless by direction of the State forest commissioner. It is made the especial duty of all forest officers to exercise the utmost care and vigilance in the prevention and extinguishment of fires likely to endanger the forest growth, and to apprehend any person who may be guilty of causing such fire.

Any person refusing to aid in extinguishing fire shall be fined $25 to $100. All forest and peace officers are required to arrest and prosecute trespassers on State woodlands. District officers shall be subject to county officers and both shall make annual reports to the State forest commissioner. Road overseers shall receive $3 per day and county commissioners the same per diem as is allowed for their services as county commissioner.

No county shall expend more than $100 per year under this act.

No lumberman can serve as forest commissioner. The law also provides premiums for planting trees along roads and irrigating ditches.

In *New York* a forest fire law was passed in 1885 as a part of a comprehensive forestry measure, viz, "An act to establish a forest commission and to define its powers and duties and for the preservation of forest." It was the first State to establish the principle of creating officers responsible for the execution of the law, and organizing an army of fire wardens throughout the State.

In 1895 (Chapter 974, Session Laws 1895, approved June 7, 1895) a change in the administrative features of the commission was made, but the duties of the new "Board of Fisheries, Game, and Forests" as far as the enforcement of the regulations against forest fires are concerned, remain the same; the chief forester being charged with this duty, with the fish, game, and forest wardens acting as fire wardens on the State lands and the supervisors of towns outside of State lands. The general features of the bill are the same as in the Maine law. The penalty for wilfully or negligently setting fire to any waste or forest lands belonging to the State or to another person is a fine of $50 to $500, and liability to parties injured in full damages.

The law is elaborate in detail, authorizing in addition to the fire service as outlined above, the establishment of the State forest reserve, the Adirondack Park, and deer parks in the Catskill region; and including very full regulations for the protection of fish and game.

Pennsylvania from early colonial times has had laws for the protection of forests from fire. The law of March 13, 1895, creates the office of commissioner of forests as a part of the department of agriculture. The secretary of agriculture of the State is required to enforce all laws designed to protect the forest from fires and from all illegal depredation, report conditions and extent of forest lands, statistics of timber cut, etc. The act of June 2, 1870, makes it the duty of the county commissioners in certain counties "to appoint persons under oath whose duty it shall be to ferret out and bring to punishment all persons who wilfully or otherwise cause the burning of timber lands, and to take measures to have such fires extinguished where it can be done; the expenses thereof to be paid out of the county treasury." * * * Act No. 173 of the session laws of 1887 as amended by act of May 14, 1891, in addition to providing a bounty for tree planting, prescribes as penalty for * * * kindling fire in any forest land without consent of the owner * * * or permitting fire to spread to the lands of another, a fine of $100 and costs for each offense.

The *New Hampshire* law (Chapter 44, Laws 1893) establishes a forestry commission, makes the selectmen of towns fire wardens, and authorizes the county commissioners to appoint fire wardens

where no town organizations exist. Fire wardens to be paid by the town or county. Chapter 110, Laws 1895, authorizes the forest commission to appoint a suitable number of fire wardens, upon the application of owner of a tract of forest land where no town organization exists for said tract, and limit the term of employment, fix compensation, etc., one-half the expense to be borne by the owner and one-half by the county.

The above quotation and abstracts represent the most advanced position in forest fire legislation in the United States. Following is a summary which contains citations to date of revised statutes and codes, with chapter and section, of the laws of all the States and Territories bearing on forest fires:

Summary of Forest fire laws.

State.	Edition of Code.	Title.	Chapter.	Section.	Penalty.
Alabama	C. C. 1896			4226-8	Fine $10-200; if turpentine forest. $100-$1,000, or hard labor for not more than 12 months.
Arkansas *a*	S & H's D. 1894.		48	1580-4	Fine $25-$300, or jail 10-60 days. Liable for double damages.
California *b*	P C 1886.	10		384	Fine not more than $1,000, or jail not more than 1 year, or both.
Colorado *c*	Mills G. S. 1891.		36	1414-15 17-18	Fine $50-$300, or jail 15 days 3 months, or both. If on State lands, 50-500 or 20 days-6 months.
Connecticut *d*	G. S. 1888.	19	99	1458	Fine $20-$300, or jail 2-6 months, or both.
				1460-2	Fine $1-$50, or jail not more than 30 days.
Delaware *e*	Vol- 18.		93	1-2	Fine $25.
Florida	Laws 1879.			3141	Fine not more than S.100, or jail not more than 60 days.
Georgia *f*	1882.		10	1456-9	Fine not more than $1,000, or 1 year in chain gang, or both.

a S 1847: Burning off permitted when consent of neighbors is secured after 1 day's notice.

b Pol. Code S. 3344-5. Persons firing woods, etc., liable in treble damages. Constable, etc., may order any inhabitants liable to poll tax to assist in extinguishing fire.

c See page 5.

d Must give notice, before burning off, to all residents within one mile, and can only be done between February 15 and March 31, unless otherwise ordered by county commissioner.

e Prohibits building fire in woods without owner's permission, and without first clearing away combustibles, and extinguishing fire.

f Must give 1 day's notice, before burning off, to adjoining property owners, and then only between February 20 and April 1.

Summary of forest fire laws—continued.

State.	Edition of Code.	Table.	Chapter.	Section.	Penalty.
Idaho	R. S. 1887.	9		6921	Misdemeanor.
Illinois	R. S. 1895.		38	18	Fine $5-$100.
Indiana	R. S. 1894.		5	2001	Fine $5-$100 to which may be added imprisonment not more than 30 days.
Iowa	McLean's 1888.	24	3	5185-92	Fine not exceeding $500, or jail not exceeding one year.
Kansas	C. L. 1889.			7276-8	Fine $50-$500, or jail 10 days to 6 months, or both.
Kentucky	G. S. 1888.		29	5-6	Fine $100, or in discretion of jury.
Louisiana	1884.			817	Fine $5-$500.
Maine *g*	Laws 1891.		100	5	Fine not exceeding $100, or jail not exceeding 30 days, or both.
Maryland *h*					
Massachusetts *i*	Sup. 1888.		163	1-2	Fine not more than $100, or jail nor more than 6 months.
Michigan *j*	Howell's A. S. 1882.		328	9402-4	Fine not more than $100, or jail not more than one year, or both.
Minnesota *k*	G. S. 1878.		95	6	State prison 6 months to 2 years.
Mississippi	1892.		29	1091	Fine $30-$200, or jail not more than 3 months, or both.
Missouri	R. S. 1889.		47	3613	Fine not more than $500, or jail not more than 12 months.
Montana *l*	P. C. 1895.			1071-2	Fine not more than $1,000, or jail not more than 1 year.
Nebraska	1895.		c. c. 9-62	6713	Fine $5 $100 and jail from 1-6 months.
Nevada	G. S. 1885.			4794	Fine $200 -$1,000, or jail 10 days to 6 months, or both.

g See page 4.

h No law included in Revised Statutes.

i Ch. 296, S. 1-6, G. S. 1883: Duty of fire wardens to post warnings, extinguish fires, and investigate causes of fires.

j Supervisors and highway commissioners to order assistance in putting out fires; fine $5-$50 for refusal to assist.

k See act of April 18, 1895, quoted entire in this circular (Page 1).

l Penalty for failing to extinguish camp fire, or malicious firing of woods fine not exceeding $5,000, or imprisonment not exceeding 5 years, or both.

Summary of forest fire laws—continued.

State.	Edition of Code.	Title.	Chapter.	Section	Penalty.
New Hampshire *m*	P. S. 1891.	.....	277	3-7	Fine $10-$2,000, or imprisonment not more than 3 years.
New Jersey *n*	R. S. 1877.	Fire,	.....	1 and supplements.	Fine not more than $100, or jail not more than 1 year, or both.
New York *a*.....	R. S.....	14	20	.....	Fine not exceeding $1,000, or imprisonment not exceeding 1 year.
North Carolina *b*...	Vol. 1. 1883	.....	7	52-4	Fine $50.
North Dakota	1895	....	P. C. 40	7314-15	Wilful, a misdemeanor; negligent, fine $10-$100.
Ohio *c*.....	R. S. 1894.	.....	.....	6334	Fine not more than $100, or jail not more than 20 days, or both.
Oregon *d*	Sess. 1893	.....	.....	Page 45	Fine $10-$1,000, and in certain cases penitentiary not exceeding 1 year.
Pennsylvania *e*.....	1894	.....	.....	Act of June 11, 1879-81	Fine not more than $300, or jail not more than 1 year, or both.
Rhode Island.....	G. S. 1886...	.....	279	6	Imprisonment not exceeding 2 years.
South Carolina *f* ...	1893	Crim. Stat.	101	151-7	Fine $5-$100, or jail not more than 30 days.
South Dakota	Dak. Ter. ...	.....	.....	2398	Fine not more than $500, or jail not more than 1 year, or both.
Tennessee *g*	M. & V. C. 1884.	....	....	2277-8	Forfeit $100 to prosecutor and fine $5-$50 (S. 2277 Code Sup. 1893)
Texas	P. C. 1889.	17	2	69-70	Fine $50-$300.
Utah *h*	C. L. 1888.	10	.. ..	4576	Misdemeanor.
Vermont.....	1894	32	213	4934	Fine not more than $500, or penitentiary not more than 5 years

m See page 6.

n Ch. 188, G. P. Laws 1888. Provides detectives for violators of fire law Ch. 119, Laws 1892, and Ch. 194, Laws 1894. Provides for fire marshals and defines their duties.

a See page 6.

b Fine $10 for leaving unextinguished camp fire. Two days' notice in writing before firing one's own woods.

c S. 4750-1; Penalty for refusing to assist in extinguishing fires, fine $10.

d Requires governor to issue proclamation annually July 1, warning people against forest fires.

e See also page 6.

f If turpentine farm, fine $500, or penitentiary 1 year.

g Owner may fire his own woods after two days' notice to neighbors.

h Ch. 27, Laws 1892. Duty of county sheriffs to extinguish fires.

Summary of forest fire laws—concluded.

State.	Edition of Code.	Title.	Chapter.	Section.	Penalty.
Virginia	1887		181	3701-2	Fine $5-$100, and jail 1 to 6 months.
West Virginia	1891		2	81-84*a*	Fine $10-$1,000, or jail not more than 1 year.
Wisconsin *i*	R. S. 1859.			4406	Fine not more than $500, or jail not more than 1 year.
Wyoming *k*	R. S. 1887.			920-2	Fine not more than $500, or jail 30 days-6 months.
Arizona	R. S. 1887.			608-9	Misdemeanor. If on State or U. S. lands, fine not more than $1,000, or jail not more than 1 year, or both.
New Mexico	1884			2313-4	Fine $60-$500.
Oklahoma *l*	1893		25 37 entire.	2269-70	Fine $10-$500, or jail not more than 1 year, or both.

i See page 4.

k Permits firing grass and sage-bush, March, April, and October, if kept within control.

l Camp fires; and regulations for bringing off prairies, etc., Ch. 37 (enacted 1890) provides penalties for setting fires and failure to extinguish.

B. E. FERNOW,

Chief Division of Forestry.

Approved.

J. STERLING MORTON,

Secretary of Agriculture,

WASHINGTON, D. C., *March 16, 1896.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd July 1896.

EAST INDIA TEAK.—The deliveries for the first half of the year amount to 10,461 loads as compared with 7,978 loads in the first half of 1865, and for June this year they fell to 869 loads against 1,778 loads in June, 1895. The market continues to be firmly held and buyers are slowly approaching sellers, views, although reluctantly. They have not much to wait for, as although there will doubtless be plenty of wood available for the future, there is certainly no surplus visible for the present, and there is every prospect that supplies will continue to be well anticipated by the demand.

ROSEWOOD.—East India.—There is no unsold stock, and good wood, in small parcels, would find buyers at quotation.

SATINWOOD.—East India.—There is a very fair demand for figury logs and boards, the latter have readily found buyers on arrival, but of the former there have been no shipments for some little time.

EBONY.—East India.—Good lots would realise very fair prices, but small shipments are sufficient.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£6	to	£10
Satinwood	„ sup. foot	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, July 1896.

Cardamoms	per lb.	1s. 1d.	to	2s. 8d.
Croton seeds	per cwt.	65s.		
Cutch	„	17s.	to	32s. 6d.
Gum Arabic, Madras	„	45s.	to	65s.
Gum Kino	„	£20	to	£25.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 2½d.
„ Burma	„	1s 4d.	to	1s. 11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.
„ Jubbulpore	„	3s. 9d.	to	6s.
„ Godavari	„	2s. 6d.	to	4s. 6d.
Nux Vomica, good	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Sapanwood, Madras	„	£4	to	£6, 5s.
Seed lac	„	70s.	to	95s.
Tamarind	„	6s.	to	7s.

Statement of average selling rates of timber and bamboos in Moradabad, Cawnpore, Pilibhit, Bareilly, Bulandshahr, and Delhi, for the month of June 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sál and Sain, &c., Karis 12′×5″×4″ Sal ...	50 0 0	60 0 0			
Sain	30 0 0	40 0 0	...	...	
Sál bed posts, 7′×2½″×2½″	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
CAWNPORE.					
Sál, 10′ Tors (Poles) ...	3 0 0	4 0 0			
Sál and Sain, &c., Karis 12′×5″×4″ ...	15 0 0	40 0 0			
Sál bed posts 7′×2½″×2½″ ...	7 8 0	9 8 0			
Bamboos of 9′ to 10″ per 100 score ...	...	...	22 8 0	45 0 0	
PILIBHIT.					
Sál, 10′ Tors (Poles) ...	30 0 0	60 0 0	...	...	
Sál and Sain, &c., Karis 12′×5″×4″ ...	25 0 0	35 0 0	..	...	
Sál bed posts, 7′×2½″×2½″ ..	4 0 0	5 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	33 0 0	80 0 0 / 400 0 0	
BAREILLY.					
Sál, 10′ Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sál and Sain, &c., Karis, 12×5×4″	25 0 0 / 40 0 0	35 0 0 / 50 0 0 / 60 0 0	...	..	
Sál bed posts, 7×2½″×2½″ ...	10 0 0	25 0 0			
Bamboos of 9′ to 10′ per 100 score ...	..	...	50 0 0	137 0 0	
BULANDSHAHR.					
Sál, 10′ Tors (Poles) ...	11 0 0	12 0 0			
Sál and Sain, &c., Karies Sain 12′×5′×4″ ..	30 0 0	35 0 0			
Sál bed posts, 7′×2½×2½ ...	...	...			
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	60 0 0	
DELHI.					
Sál, 10′ Tors (Poles) ...	7 0 0	10 0 0	..	...	
Sál and Sain, &c., ... Karis, 12′×5″×4″ ...	50 0 0 / 25 0 0	60 0 0 / 30 0 0	...	...	
Sál bed posts, 7′×2½″×2½″ ...	9 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	25 0 0	75 0 0	

THE

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Remarks on the new Edition of D'Arcy's "Forest Working-plans in India."

It is to be regretted that the late Mr. D'Arcy is no longer amongst us to revise his interesting work on the organization of forests. The editor of another's work must always be handicapped by the feeling that he is not justified in altering materially the views expressed in the original text, no matter what his own opinion may be; but the author himself need have no scruples of this kind and can, if necessary, alter his views to suit the dictates of more mature experience.

The second edition of this book has been brought out by an unknown hand, without, it is stated, much alteration of the original text. But it is, unfortunately, issued from the office of the Inspector-General of Forests to the Government of India, and, although it is distinctly stated in the preface that the book is not to be regarded in the light of an official code of instructions, it bears the imprimatur of the head of the Forest Department, and will, no doubt, for this reason, be very generally followed by Forest officers, whether they agree with all the views it contains, or not. Such a consummation is scarcely to be desired, as we must look to the researches of practical organizers to clear up much that is obscure in the organization of forests, and this object is not likely to be promoted by blindly following any particular author.

Perhaps the worst feature of a short treatise on a complicated subject is that the writer, being necessarily cramped in regard to space, cannot always find room for the opinions of every writer of eminence, with the result that he may be constrained to lay before his readers incomplete accounts of matters of importance, or even to state only his own opinion, on controverted subjects, without affording the uninformed reader an opportunity of forming by comparison an opinion of the soundness of his conclusions. The present work is necessarily by no means free from this defect.

An important subject—the determination of the most advantageous revolution—is, for example, most inadequately discussed, and the reader is left entirely in the dark regarding the fact that the views held by the author are diametrically opposed to those of many—it might even be said, most—leading authorities of our day. Again, when dealing with the subject of interest, the author briefly dismisses it with the remark that, although of considerable theoretical interest, a discussion of it is of no practical value; presumably, because its practical application has not come within the purview of his own particular practice. These examples, which might easily be multiplied, suffice to illustrate the disadvantages under which an author labours when attempting to write a short treatise on a wide and much discussed subject.

It is a question if the title of the book should not have been "on the organization of forests" instead of "on the preparation of working-plans." The author really endeavours to give a more or less complete review of the whole range of organization, and goes far beyond the actual working-plan of the forest. Indeed, it is difficult to conceive how a pamphlet on working-plans, pure and simple, could be made intelligible without a review of the whole subject of which the working-plan is a part; and the author, by the way in which he has dealt with his subject, tacitly acquiesces in this view.

He begins by defining a number of terms, some old and established, some new: and some which, though old, can scarcely be said to be established, and which appear to require reconsideration; and again, some of which the definitions do not appear to me to be quite correct. 'Windfall,' for example, I have always understood to refer to trees, or portions of trees, thrown down, or broken off, by natural causes only. The term "leaf-canopy" is to my mind rather far-fetched, and I think that the term "leaf-cover," or simply *cover* is a more simple, and, therefore more acceptable term. The word *pure* appears to be out of place in connection with crops, and I prefer the term *unmixed*. The term *pure forest* does not convey to the uninformed the idea of a forest which consists of only one species, but of a forest in which there is nothing except trees, whereas the term *unmixed* does. *Pure* is the opposite of *impure*; therefore, the latter term should be applicable to mixed forest, but would anybody dream of applying it in that sense. The word pure in this connection is just a bad, though literal, translation of the German word.

The term "tree" is defined as a woody plant having a single stem of considerable length and which is capable of attaining a height of at least 25 feet; while a "shrub" is said to be "a plant which does not attain a height of 25 feet and which generally throws out branches at or near the ground." According to these definitions, a tree whose stem has been cut off near the ground and which throws out shoots from the stump, is no longer a tree, nor is it a shrub. And, according to the latter definition, any herbaceous

plant which branches near the ground is a shrub. I think these definitions require revision.

Density is defined as the degree of completeness of the "leaf-canopy" (or, as I would prefer to call it, 'cover'). I believe, however, that this term usually refers to the quantity of growing stock, not to the completeness of the cover. If I say that a group is ·5 stocked, I mean that the ground is only half-stocked with trees; that it could carry twice as many if fully stocked. In this sense, the cover may be complete in an incompletely stocked wood. This confusion of ideas leads the author to a confused conception of the terms *complete* and *incomplete* density. He says that a crop is complete "when it presents a density conformable to its nature and age; when this is not the case, it is incomplete." There is nothing contradictory in this rather abstract definition if the word *density* means, what I conceive it to mean, but it will not do if the author's definition of density be accepted. He says, "the density of a crop is the degree of completeness of the leaf-canopy"; from which it follows absolutely that when the leaf cover is complete, the density is complete, and, when the cover is incomplete, the density is incomplete, without any possible modification due to the "nature and age" of the crop.

The term *cover* (of a tree) is defined as the horizontal projection of the crown on the ground. So far, so good, But I would add that the cover of a *crop* is complete when the shade afforded by its cover is perfect, less degrees of cover being usually expressed in decimals, from ·9 to ·1.

High forest is a term which might be abolished in a technical sense from our forest literature. *Seedling forest* is in every way a better term. It is ridiculous to call a group of seedlings a year old, high forest. There is apparently no necessity to use a term in a technical sense simply because Germans have been so illogical as to introduce and perpetuate it in their language.

The author defines a *seedling crop* as a seedling forest up to the time at which its "newly developed branches meet." This appears to be a rather vague definition, and to clash with the definition of *seedling forest*, which is stated to be, unconditionally, "a crop composed of trees which have sprung from seed." I take it that a crop is a seedling crop provided it originates directly from seed (*i.e.*, is not coppice, sucker, nor pollard growth), no matter whether the "newly developed" branches have met, or not. Its essential characteristic is that it originated directly from seed, and this fact is not affected in any way by the meeting of branches new or old.

To an Englishman, the term "storeyed forest" (? storied forest) must always appear ill-chosen. It conveys the idea of one well defined thing on the top of another, and so on, in regular order. But no forest grows in layers in that way, and the so-called storeys must be imperceptible to the eye. It is apparently a form

of jardinage, invented recently; it might be given the name of its inventor.

In referring to the method of natural regeneration by seed, the author speaks of a preparatory, *or* seedling-felling. I think he should have said a preparatory *and* a seedling-felling (German—Vorbereitungsschlag and Besamungsschlag); the first being made with a view to the preparation of the ground for the reception of seed and the second with a view to favour the seeding of the tree.

The definition of a *block* given by the author does not coincide with that of German writers, but with their definition of compartment and his definition of compartment with their sub-compartment.

The term *cutting rotation* is used in this book to denote the period required to work through a series from end to end in jardinage. I think the term *cutting cycle* would be a more expressive and appropriate term, because it appears to me to be undesirable to use the word *rotation* in any sense except that in which it is used in agriculture.

A term is wanted to denote a mass of forest of uniform appearance—a word equivalent to the German word *Bestand*. I have used the word *group* in this sense; it is certainly not a very appropriate term, but I cannot find a better.

On the vexed question of the scale on which maps should be drawn, the author has not much to say. He considers that the 4-inch is generally the largest required in India, and this opinion will probably tally with the experience of most Indian foresters.

It may, however, be doubted if it is always desirable to show all the natural features, such as hills, valleys, water-courses, etc., on the maps. There is, I think, a tendency to the over-elaboration of forest surveys in this country—a fact which, if true, is not unnatural, considering that they are generally the work of a separate department whose members are ignorant of forest requirements, and who are naturally anxious to make them as perfect as possible. The assumption of a certain standard of average cost per square mile as a fair cost for a survey on a given scale also tends towards a high rate relatively to the value of the country surveyed: the Survey Department is apt to think that if it can keep its average cost per square mile down to, say Rs. 180 for a given scale, it is doing very well. Vast areas are often surveyed on the same plan, all with the same degree of minuteness of detail, when a very varying quantity of detail would often be indicated, and in this way large tracts may easily be taken up, for which maps are either not required at all, or for which mere skeleton maps would answer every purpose. There must be few foresters of long experience who could not cite cases in which a delineation of boundaries

would have answered all practical purposes, but in which more or less elaborate surveys have been carried out.

Had the author lived to revise his work, it is a question whether he would not have seen fit to modify his views regarding the formation of so-called working-circles. It may be doubted if limits to the size of working-circles are a matter of importance, although the size of coupes may be and often is, a matter of great moment. On page 37, he writes, "If the circles are too large, the area to be exploited in one place, or at each operation, may be inconveniently extensive, and the distance to which the material must be conveyed too great; or more produce may have to be felled than can be consumed in the centre of consumption, to which it must be transported if it is to be utilized at all" . . . . . "Generally speaking, when all the produce of the fellings is saleable the working-circles would be comparatively small." Again, "It should be remembered that when equality of yield from year to year is desired, such equality can be better secured by forming a number of small, rather than a few large, circles." From these quotations it certainly appears that the writer assumes that only one cutting should be prescribed annually for each circle. There is also good reason to suppose that he is an advocate of the location of the annual cuttings in regular succession one behind the other.

This idea, that coupes should be made one behind the other in regular succession, or that only one coupe should be carried out every year in each working circle is surely out of date. There appears to be little or no advantage to be gained by such a procedure in forests subject to regular methods of treatment, while its rigidity may be the greatest hindrance to elastic and economical management, and it could probably never be carried out in hitherto unorganized forests subject to regular methods of treatment, except at great loss to the proprietor.

It is difficult to understand how the author came to consider that only one coupe should be made each year for each working-circle; but that such was the case appears to be quite certain. The paragraph quoted would otherwise have no meaning, because in large circles the coupes could be increased to any required number, and suitably located.

That he would also prescribe that, as a general rule, with possibly a few exceptions, the exploitation each year of one coupe behind the other in regular succession, is certainly not evident from the above quotations, but there can, I think, be no doubt about it, because on page 22 he refers, with approval and without adequate qualification, to clearances made in regular succession, and returns to the subject on pages 34 and 67. On page 22 he writes, "or the clearances may be made in regular succession over small adja-

cent areas," and on page 34 we find that "where the whole crop is saleable, and in climates where natural reproduction is assured, the method of *clearing* or *clean felling, adjacent* areas may be applied in certain cases for the sake of its extreme simplicity and the order it introduces into the fellings. It should not, however, be made use of where the working circle and consequently the coupes are very large, as it leaves reproduction to chance, and the larger the coupes the smaller the chance." On page 67, a general rule for all *régimes*, is laid down; "the fellings should be adjacent and succeed one another in the order in which made;" there is nothing in these extracts to shew what heavy sacrifices the proprietor will have to make in—I think, I may say *all*—cases except those in which the *régime* of jardinage is prescribed, a possible defect of the method which should, one would think, be noted in a work on organization.

Under "analysis and description of the crop" the *block* is taken as the permanent unit of description. It answers, as already observed, to the compartment of the German forester, whose blocks consist of 2 or more compartments. I must say I prefer the term compartment for the unit, and its use gives us the advantage of having the additional term *block* to denote a compact series of compartments separated from others, or from the other areas by main rides or their substitutes.

In this section, the density is again referred to as being measured by the density of the leaf-cover, instead of by the relative density of the trees as compared with a complete crop.

The author is somewhat doubtful regarding the usefulness of written descriptions of blocks (compartments). He considers that they are not of much use to the organizer himself, nor to those whose business it is to scrutinize the plan, and that possibly stock-maps would be preferable. This supposition may possibly be true for jardinaged forests, but would scarcely apply to groups subject to other *régimes*. The usefulness of written descriptions will probably be better appreciated in subsequent years when comparing the then state of the compartments with their former state, and no stock maps could make up for the written description. No doubt they are often too prolix, and the description for one compartment would often do for several others.

The plan adopted by Colonel Wilmer, and quoted by the author, of classifying areas according to species and soil at the time of the survey of the forest, would probably cost more than it was worth, as no forester could organize his forests from such descriptions or without going over the ground himself, but they might sometimes be useful for large tracts of waste land by assisting a selector to determine which areas to keep for forest and which to leave for the extension of cultivation.

At page 44, the term "valuation survey" is used to express the procedure known to Frenchmen as "the taking of the inventory

of the forest." The former term is of old standing in India, but it is obviously a wrong term, as there is no valuation about it. I have used the term assessment to express the same meaning, but it, too, is open to objection, and I think a more appropriate term to be "The taking of the inventory," or "stock-taking," as that is what the operation really consists in—not in making an estimate of its value which must come after the taking of the inventory.

It may be doubted if there be anything gained by separating sound from unsound wood in the inventory. It is quite impossible to say which growing trees are sound or unsound, and nearly every mature tree in the large timber forests with which I am acquainted, turns out unsound when felled, although it may be growing vigorously. Dead trees, on the other hand, can be recognized and should certainly be left out of the enumeration altogether, as they will generally come away with the thinnings.

In dealing with the calculation of the volume of trees, the author refers to "type trees" and "form-factors;" the terms "test-tree" and "form co-efficients" appear to me to be preferable, more particularly the latter, which is, at all events, English for what is meant, whereas the words form-factor and reducing-factor (which are often used) are just bad translations of the German term.

I now come to that part of the treatise which deals with the exploitable age of trees (p. 58). A general rule is laid down that *price* is the best guide to the determination of the most advantageous revolution. * In other words, that revolution which is calculated to afford the highest net annual revenue is recommended as most advantageous; local conditions may sometimes necessitate its modification or abandonment, but otherwise the guiding principle for the determination of the most advantageous revolution is, according to our author, *price*.

If carried out to its logical conclusion, this principle would necessitate the prolongation of the revolutions of most of our timber-species far beyond the age at which they are usually considered exploitable. Seedling teak would ordinarily have to be subjected to a revolution of 250 years or more, and other large timber species in proportion to their longevity. Six-inch timber will nearly always be more valuable than three-inch; that is to say, it will fetch a higher net price per cubic foot, and 9-inch than 6-inch, and so on up to a certain point. As regards this point, it appears to be merely a question of fairly good communication and the strength of the means of transport; as long as these are sufficient, the larger timber will, so far as my experience goes, always fetch a higher net price.

On page 59 it is stated that "Indian forestry is not ripe for elaborate calculations and must be satisfied with felling when the revenue will be highest or the produce most useful, otherwise

* I use this term in preference to *rotation* because the latter has quite a different meaning in agriculture and refers to successive changes of crops. *Revolution*, on the other hand, has no double technical meaning, and should, for this reason, be preferred, I think.

it would be also necessary to consider the greater capital involved in producing the larger-sized timber in view to taking account of the rate of interest (*sic*) on that capital." What does the writer mean by "the most useful produce," and how are we to decide which description is really the "most useful." The term "most useful produce" is one that French writers are very fond of, and I think I am right (I quote from memory) in saying that M.M. Nanquette, Broillard and Paton agree in considering that the most useful wood is that for which the highest price is obtainable per unit of measurement. Possibly I should say the highest net price. That point is, however, of no consequence, so far as I am concerned, as either assumption is wrong according to my view. The late Mr. D'Arcy seems to have followed the French School in this, as well as in many other matters; and I think we might, therefore, take for granted that his "most useful produce" is that for which the highest net price is procurable, and that, consequently, the revolution under which the most useful produce is obtainable is, according to his view, that for which the highest net price is obtainable. But, on page 58, he makes this point quite clear by stating that "when poles, or timber in the rough or logs, are sold, the price realized per cubic foot for differently sized pieces directly indicates the size of the trees which are most useful."

To prove the erroneousness of this view ought not to be a very difficult task. The principal point is that the values of two things received at different times cannot be directly compared. If I am offered the choice of a penny-loaf now, or a year hence, one offer is distinctly more advantageous to me than the other, although the intrinsic value of each loaf is the same. Or, if I am to-day offered a group of trees worth £1,000, or am promised, as an alternative, twenty years hence, a block which will then be worth £2,000, should I not, before deciding, ascertain what the net value of the latter is discounted to the present day, and having settled this point, accept the offer calculated to give me the highest return? Whether the late Mr. D'Arcy would, in my place, have acted in this way, is perhaps doubtful, but it is quite certain that, if he acted on the principle laid down by him in this book, he ought not to have done so. Suppose, now, that a perfectly safe investment, at 4 per cent. interest, can be obtained on mortgage of landed property or in other ways; before deciding which offer to accept, I naturally determine to find out what a sum of £1,000 comes to at 4 per cent. interest, in 20 years. That sum amounts to £2,191, and I of course accept the group worth £1,000 at the present moment, put the sale-money out to interest, and after the lapse of 20 years am £191 richer than would have been the case had I accepted the other offer. It is quite immaterial to me what the value of a cubic foot of each group is worth at the time of exploitation. Similarly, if I wish to find out whether a group is financially mature now, or if

it would be more advantageous to leave it standing twenty years longer, I must at least compare its value now with its prospective value twenty years hence, and cut it at once, or allow it to stand, according as its prospective value, discounted to the present time, is less or more than its present value. I can, if I wish to be more accurate, introduce certain refinements into the calculation, but in no case can the net value of a cubic foot of the produce be of the slightest assistance, except to enable me to estimate the value of each group at the time of cutting.

Strictly speaking, the most advantageous revolution is of course that which affords the highest prospective land-value; and if, for a unit of area, H_r represents the net value in the year r of the main cutting: r=the length ofthe revolution: D_a, D_b. .....D_n=the net values of minor receipts harvested in the years a, b.....n: p=the rate per cent. at which the proprietor can borrow money: c=the cost of cultivation: V=a capital, the interest on which will defray all annually recurring expenditure on account of supervision, taxes, etc.: B=the value of the land:

Then, for any revolution, r,

$$B = \frac{H + D\,(1{\cdot}op)^{r-a} + D\,(1{\cdot}op)^{r-b} \ldots + D_n(1{\cdot}op)^{r-n} - c\,(1{\cdot}op)_r}{(1{\cdot}op)^r - 1.} - V$$

It may at once be admitted that it is seldom possible to obtain all the *data* necessary for the exact calculation of the land-value, for different revolutions, in the above manner. The number and exact value of successive thinnings will seldom be known and even the estimate of main cuttings may be difficult to make with accuracy. The value of V is the same for all revolutions and may, therefore, be omitted. The cost of cultivation, if any, should generally be ascertainable, but neither it, nor the value of intermediate cuttings, can greatly affect the length of the financial revolution. When, therefore, the intermediate receipts are not known, they may, I think, for all practical purposes, be neglected. The estimate would then be generally confined to the main cuttings.

It seems to me that too much importance has been attached by the opponents of the financial mode of treatment to the difficulty of ascertaining accurately all the *data* necessary for a strictly scientific solution of the problem. What appears to me to be wanted, both in this country and Europe, but more particularly in this country, is, not a pedantic estimate, but one which is calculated to give fairly accurate results, or, at all events, to prevent gross errors, which cannot fail to be of frequent occurrence if we rely on the revolution which is calculated to afford the highest net revenue. Nobody pretends that even under the most favourable circumstances, the financial revolution can be determined with mathematical accuracy, but it seems to me to be going too far to assert, as the advocates of the chance procedure

recommended in this book virtually do, that because some *data* necessary for exact determination are seldom or never available, all attempts at approximation should be abandoned. It would be almost as reasonable to assert that because the area of a circle cannot be exactly determined, it is useless for practical purposes to attempt to calculate the contents of a cylinder. It also seems to be unreasonable to expect to obtain better results from a method based on irrational principles, than from one which, although imperfect, starts from a rational basis, and is as far as possible correct.

I am inclined to think the problem can often—perhaps in most cases—be still further simplified by taking a single average tree as the standard of comparison instead of the crop on a unit of area. I see no reason why this mode of dealing with the matter should not answer perfectly for all practical purposes in connection with forests with which I am acquainted. It may even be possible sometimes to employ a method which does not necessitate the determination of the full age of the trees examined although this factor can generally be determined with sufficient accuracy. Take, for example, jardinaged forest: the important point to decide is the diameter, at breast height, of a tree, which roughly corresponds with its financial maturity. In the case of teak and other species with long revolutions, an approximation within 20 or 30 years of the true revolution, should satisfy all practical purposes. We might, then, according to this plan, proceed as follows:—Compare the value of typical trees of different diameters, proceeding by differences of, say, 4 inches, or such other magnitude as may be considered desirable in each case. Say we wish to compare the value of the 20-inch tree with that of the 24-inch. tree in a teak-forest, and that it takes 30 years, as ascertained by experiment, for the 20-inch tree to grow into a 24 inch tree. We first of all determine the value of a 20-inch tree by felling and cutting up a few averaged sized trees of that class. In order to determine the value of their produce, it may be put up for sale in the usual manner, or its value may be estimated from the previous knowledge of the value of a cubic foot of each description of saleable produce yielded, which would probably be generally a better plan. From the total sum thus obtained, the cost of cutting and transport to a sale-depôt would have to be deducted; and the remainder, divided by the number of trees examined, would give the net value of a tree of 20 inches diameter.

In the same manner, the contents and net value of a 24-inch tree can be determined. Or, its volume can be determined by adding to the saleable volume of the 20-inch tree its increment for 30 years. The net value can then be easily calculated, including a quality-increment if any is expected.

The question that remains to be decided is whether it will be more profitable to cut down the trees when they are 20-inches, or when they are 24 inches, in diameter. Supposing, now, that the

20-inch tree yields saleable produce of the value of Rs. 40 net, that the 24-inch tree yields saleable produce of the value of Rs. 150 net, and that the rate of interest is 4 per cent. The present value of the 24-inch produce which would be realised 30 years hence would be $150 \div (1{\cdot}04)^{30} =$ Rs. 46. It would, therefore, be more profitable to allow the trees to stand until they attained a diameter of 24 inches. It would then be desirable to determine the value of a 28-inch tree as compared with one of 24, and so on until a maximum is reached.

Not long ago, a case occurred in which it was a question whether the revolution of certain teak forests, should be of 30 or 60 years. The organizer was in favor of one of 30 years, while some others inclined towards one of 60. It was found that the net value of a stem 30 years old was Re. 1, while that of a stem 60 years old was Rs. 2. Two revolutions of 30 years would pass away during one revolution of 60, and it was argued, against the organizer's view, that the net returns would be exactly the same for either revolution, namely Rs. 2, and that the pecuniary profit to Government would, therefore also be the same in each case. How fallacious this opinion was is evident if the respective receipts be put in a more proper relation to each other.

Applying the rough mode of calculation just described, we should arrive in the following manner at a more correct comparison of the figures. The estimate is made for 60 years, as two revolutions of 30 years are comprised within that period and one of 60.

30 years' revolution.

	Rs.	Rs.
At the end of the first revolution each stem is cut and realizes Re 1. This sum carried forward for 30 years, at 4 per cent. interest, amounts to	3¼	
Add for each stem available at the end of the 2nd revolution	1	
Total ...		4¼

60 *years' revolution.*

The net value of a stem 60 years old is	2
Difference ...	2¼

The 30 years' revolution is, therefore, according to this estimate more than twice as profitable as one of 60 for these particular forests, apart from sylvicultural and other economical reasons that all point towards the desirability of a short revolution.

The following would be a more correct mode of comparing the two revolutions, and could be easily carried out:—

For the 30 years' revolution.

The present value of a stem obtainable every 30 years would be ...	Re. 1 ÷ $(1{\cdot}04)^{30} - 1$ =	·45
The present value of a stem obtainable every 60 years would be ...	Rs. 2 ÷ $(1{\cdot}04)^{60} - 1$ =	·21
	Difference	·24

This result comes to much the same thing as that first obtained. It shews that the 30 years' revolution would be more than twice as advantageous as a revolution of 60 years.

The correct formula for the prospective value of the soil and consequently, the relative values of revolutions, is as given above,

$$B = \frac{H^r + D_a(1{\cdot}op)^{r-a} + D_b(1{\cdot}op)^{r-b} + \ldots D_n(1{\cdot}op)^{r-n} - c(1{\cdot}op)^r}{(1{\cdot}op)^r - 1} - V$$

For the case just cited, I am not at present in a position to cite the exact *data*, although I have no doubt that they are ascertainable with as much accuracy as is generally possible in such cases either here or in Europe. I will, however, attempt to give them approximately, because it is desirable to illustrate the bearing that some of the items in the calculation have on the length of the financial revolution.

Let us suppose, then, that the fully-stocked acre will hold, on an average, 1,000 stems of 30 years of age, or 300 stems of 60 years of age: that, between the ages of 30 and 60, a group yields 700 stems, in thinnings, realized, on an average, in the 45th year of its age, and of the average value of 1½ rupees each. Further, that the yearly recurring expenditure on account of supervision, taxes, etc., is 4 annas per acre; the cost of cultivation Rs. 10; the rate per cent. on borrowed capital 4, and that no receipts can be obtained from thinnings up to the 30th year. We would then have:—

(1) *For the revolution of 30 years.*

$$B_{30} = \frac{1000 - 10\,(1{\cdot}04)^{30}}{(1{\cdot}04)^{30} - 1} - \frac{{\cdot}25 \times 100}{4} = \text{Rs. } 424$$

(2) *For the 60 years' revolution.*

$$B_{60} = \frac{300 \times 2 + 700 \times 1{\cdot}5\,(1{\cdot}04)^{60-45} - 10\,(1{\cdot}04)^{60}}{(1{\cdot}04)^{60} - 1} - \frac{{\cdot}25}{0{\cdot}04}$$

$$= \text{Rs. } 244$$

The difference in favour of the shorter revolution is, therefore, Rs. 180, and an investor who is satisfied with 4 per cent. interest on his capital could afford to pay Rs. 424 for land, for which, under a revolution of 60 years, he could afford to give only Rs. 244.

Now, supposing that in this case, no thinnings were made between the 30th and 60th years, and that the 1000 stems of the value of Rs. 2 each survived to the 60th year. The result would be that prospective value of the land would be reduced to Rs. 193 and that the 60 years' revolution would not be half as profitable as one of 30. Although intermediate receipts do not seriously affect the length of the financial revolution, they may add, if judiciously made, very considerably to the value of the returns. In order to more fully illustrate this point, which has an important bearing on the view I hold regarding the determination of the revolution, and in justification of my remark that intermediate receipts and the cost of cultivation have no marked influence on the length of the financial revolution, I take the following table of the yields of Scot's pine for successive revolutions, and calculate the returns with, and without, thinnings :

Yield of one Morgen stocked with Scots' pine
(Taken from Burckhardt's Hülfstafeln für Forsttaxatoren).

Age of group.	Corresponding value of thinnings.	Value of remaining standing stock after thinnings.	Value of main cutting.	Cost of cultivation.	Yearly recurring expenditure.
Years.	Thalers.	Thalers.	Thalers.	Thalers.	Thalers.
20	1·0	8·0	9		
30	3·5	21·7	25·2		
40	4·8	50·7	55·5		
50	5·6	100·0	105·6		
60	6·6	165·3	171·9	2·0	0·3
70	7·5	240 0	247·5		
80	7·4	293·3	300·7		
90	7·2	344 0	351·2		
100	—	—	375·0		

Taking the rate on borrowed money to be 3 per cent., the prospective value of the land, for these yields, culminates in the 70th year, with 30 thalers, including the value of all thinnings.

If, now, we exclude the value of the thinnings from the calculation, the prospective value of the land still reaches its maximum in the 70th year, but falls from 30 thalers to 18½. For a revolution of 70 years, the value of the thinnings in the 70th year amounts to 15 per cent of the main cutting, and yet the financial revolution is neither advanced nor retarded by their omission in the least degree.

Nor can the cost of cultivation appreciably affect the length of the revolution. In the above example, the cost of cultivation is Th. 2, and the capital represented by that sum is $\frac{2(1\cdot03)^{70}}{1\cdot03^{70}-1}$ for

a revolution of 70 years, or just about $2\frac{1}{3}$ thalers. For a revolution of 50 years, it would be about $2\frac{2}{5}$ for one of 100 years slightly over 2 thalers. The difference between the capital of cultivation for a revolution of 50 years and of that for one of 100 years is quite insignificant when compared with the magnitude of the net receipts, and could have no effect whatever on the length of the revolution.

The annually recurring expenditure is, as already noted, the same for all revolutions, and has no influence on the length of the revolution.

When, therefore, the items, on which the financial revolution is based, are examined closely, we find that the only really important one is the value of the main cutting, and we are forced to the conclusion that all others may safely be left out of the reckoning. Even Mr. D'Arcy's mode of procedure presupposes a knowledge of the value of main cuttings, or of average trees for different revolutions, so that really the demand his method makes on our knowledge is just as great as that made by the more correct method, and it may safely be left to the unprejudiced reader to say which of the two is more likely to be satisfactory in the long run.

I have dwelt at considerable length on this part of the subject because I think I notice a tendency, not only in the late Mr. D'Arcy's book, but also in other quarters, to deprecate all attempts at what may be appropriately called rational, in contradistinction to what may be equally-appropriately styled haphazard-organization. I also think there is a widespread inclination to appeal to the State to grow blindly the largest timber possible, whether national interests are really best served in that way, or not. That the general adoption, in respect to State forests, of the late Mr. D'Arcy's recommendations must lead to excessively long revolutions and heavy losses to Government, has, I think, been proved, and also that financial revolutions can generally be ascertained with sufficient accuracy for all practical purposes. If this much be admitted, revolutions based on the highest net value of a cubic foot of wood should soon be as obsolete in India as they are in those countries in which a more complete knowledge of the true objects of state forestry has driven out pure sentiment and replaced it by a more practical spirit.

Chapter III deals with the preparation of the working-plan. Reference is made to a preparatory period, or period within which the abnormally-constituted forest shall be brought into the ideal state, and it appears that the author considers that this object should be attained at any cost, within the period of a revolution, if not sooner. The tendency of most eminent writers of the day is, I think, not to seek to bring about the ideal state suddenly, when it can be thus effected only at great sacrifices by the proprietor,

but to attempt to realize this object, in very abnormal series, by slow degrees. The older German writers, and most French writers with whose works I am acquainted, attach great importance to the rapid establishment of an ideal state. With the advent of Pressler and his school some 30-40 years ago, the impolicy of this view was brought very forcibly to the minds of younger generations, and many writers now think that the economical working of forests is a matter deserving of quite as much attention as the early attainment of the ideal state. The organizer, they consider, should, without losing sight of the ultimate establishment of a regular system of age classes, on no account neglect financial considerations. In my opinion, this is a very sensible view to take of the matter, but it is natural enough that men, who, like the late Mr. D'Arcy, think so lightly of money losses, should stick to old ideas, and desire to see the supposed ideal state established, with the least possible delay, at any cost.

Another point, on which many readers of the '*Forester*' will join issue with the author, is the alleged desirability "where a sustained yield is not of special importance" of forming permanent annual coupes. This opinion is stated in reference to jardinaged forests, but whether it is intended to refer to all forests, as I imagine, or only to jardinaged forests, it is impossible to say for certain. What leads me to suppose that the rule is intended to be of general application is that if it is true for one kind of seedling-forests *régime*, it is also true for all others, and, *à fortiori*, for coppice.

On page 66, the institution of coupes inversely proportional to the wood they contain is objected to on the ground that during the next felling cycle totally different annual coupes may have to be formed. If the coupes have been permanently marked off, this objection may be of some value, but if they have not been permanently marked off, it is difficult to see the force of the objection. But the advisability of marking off coupes permenently appears to be very doubtful, as a general rule. It certainly seems to me to be inexpedient, as a general rule, to mark off coupes permanently in seedling forests. It seems to be, in the first place, an unnecessary expense; in the second place, it makes no allowance for unforeseen changes in the crops, due to deterioration, improvement, or one or more of a hundred other unforseeable circumstances that may occur during a revolution of 100-200 years and necessitate changes of system or treatment; in the third place, even should no accidents occur to mar the plan, it presupposes that the yield of each coupe will for ever be constant after the first revolution; in the fourth place, if seedling forests be divided up into compartments, (and where necessary sub-compartments) with well-defined compartment-boundaries, such boundaries will suffice for all requirements of orderly management, and there will be no necessity for the permanent demarcation of annual coupes. It seems to me, too, that even

under the coppice *régime*, which is generally a long one in this country, the marking off in a permanent manner of the annual coupes is frequently inadvisable. I have in my mind certain irregularly-stocked forests (which are, so far as my experience goes, the rule in India) which are so irregularly stocked that they could not be permanently marked off by means of equal annual areas, or areas inversely proportional to their productive power for the time being, without causing violent fluctuations of yield either in the first or succeeding revolutions.

In the older systems of organization, to which this book appears to adhere, there seems to be far too much rigidity and striving after finality to suit modern requirements and the advances made in our knowledge of the subject. Nobody will deny that the more elastic a system is, provided it is compatible with orderly management, the better it is for economical management.

I have already referred to the general rule, on page 67, that "the fellings should be adjacent and succeed one another in the order in which made," but will add a few more words on this important subject, against which a great deal, and for which very little, can, I think, be said. Disadvantages such as the following must at once occur to everybody :—that the coupes cannot be located alternately is different parts of the forest to suit market-demands: that great sacrifices may have to be made in irregular forests by the premature cutting of young groups and the retarded cutting of old groups : that the danger of the spreading of fires is much greater where the standing-stock is of about the same age on adjacent areas, *e. g.*, a succession of thickets in coniferous forest or grassy plantations in any forests : that when groups are languishing from injury by insects, or other causes, they cannot be removed until their turn comes : that injurious insects are more likely to spread : that a series of cuttings cannot be stopped in a block for a year or two, which may often be desirable owing to an attack of insects injurious to young growth, to temporary superabundance of wood in depôt in the locality, or temporary absence of the usual demand. I do not know a forest in this country to which this rule could be applied with the exception of forests worked in jardinage, which is a system that admits of the forest being worked through from end to end with great rapidity.

Under the head "Method of simple coppice" (p. 68) the author recommends that the revolution should be as long as possible provided that the age at which the stools cease to produce shoots shall not be exceeded (? reached). He reiterates the rule that the fellings should, as a rule, suceeed one another in consecutive order, and prescribes that the fellings shall be regulated entirely by area.

The first rule is, as I have attempted to shew, not a good one. The only reliable guide is in my opinion the financial revolution. The second rule has just been discussed, and

found wanting as a general, rule, but may sometimes be followed without disadvantage. The third rule does not commend itself to my mind as a general rule. In irregularly-stocked but valuable timber-forests, and especially when they are badly stocked, it may often be advisable to adopt a system of felling partly by area and partly by mass. The enumeration of a thinly stocked area, in which all or nearly all species are saleable, is inexpensively and rapidly accomplished, and it will, I think, often be found convenient and economical to enumerate all trees on it, and to regulate the cuttings partly by mass and partly by area. If, for example, we have a teak-coppice subject to a revolution of 40 years, we might divide the area into 4 periodic areas each equal to about ¼ of the total area of the forest. For each period we could then cut annually one-tenth of the estimated number of stems on the corresponding periodic area. In this way the annual yield would be equal for a whole period, and, if judiciously chosen, the periodic areas could be made to yield about the same number of stems annually. At the same time, the periodic areas being fixed, there could be no fear of exceeding or undercutting the area-capability, even if compartments were not there to check errors of estimation. Or the periodic areas may be abandoned, more particularly if there has been a complete enumeration, as the compartments will constitute a sufficient check in that case. Personally, I am in favor of periodic areas, because I think it is neither necessary, nor desirable, to prescribe every detail for more than a decade or two in advance. Unforeseen circumstances may easily arise which render desirable a different distribution of cuttings of the remoter periods to that originally selected or even indicate the necessity of a totally different mode of treatment.

On page 78, we are introduced to what the author calls 'storeyed forest' (should not the term be written 'storied forest'?), which seems to be a species of jardinaged forest. The method appears to necessitate for its proper execution repeated enumeration of the standing-stock, and to be too elaborate to be of much practical value to the Indian forester. At the same time, it should be noted that "it has been largely applied in certain parts of France."

It is stated, on page 80, that, in jardinaged forest, the felling of each species should not be separately prescribed, but that at most the relative proportion of each kind should be prescribed. Again, on page 82, it is stated that "the enumeration would show the relative proportion of each species; and, in the working-plan, the fellings of each may be prescribed according to that proportion. Thus, suppose that 1-3rd of the trees enumerated were of species *A*, and 2-3rds of species *B*, and that the possibility were fixed at, say, 600 trees a year

we might prescribe the felling of 200 trees of species *A* and 400 of species *B*." It is not at all apparent why the rule should be followed. The species must be separately enumerated, and, after enumeration, if their growths or revolutions are different, their yields must be separately estimated. In fact, it appears to me doubtful whether it will not in all cases be advisable to estimate their yields separately. In any case the prohibition to give the yields of each species separately is not as easily understood as the author seems to assume.

The method of fellings limited by the productive capacity of the soil (page 88): that if fellings by relative proportion (page 90): and that of proportionate volume (page 93) will be only of academic interest to most Indian foresters.

J. L. L. McGregor.

II.—CORRESPONDENCE.

The Assimilation of Nitrogen by Plants.

With reference to the letter signed M. R. in the *Indian Forester* for March last, I have a collection of *acacia cyclopis* plants from the Cape Flats showing the characteristic root-nodules in an unmistakeable manner. I have noticed the nodules also on other *Mimosæ* notably *A. lophantha* and *A. saligua*. The soil-improving action of these wattles on the poor sands of the Cape Flats is readily discernible, and no doubt in part due to the nitrogen-fixing evidenced by the roots.

M. R. has perhaps overlooked the similar power claimed for the common Alder (*Alnus glutinosa*).

Cape Town,
6*th July* 1896.

E. Hutchins.

Counting "Yas" in Burma.

I must thank Mr. Gleadow for the complimentary remarks which he has made on my short paper on "Counting Yas in Burma." I regret that I did not explain the word "ya," or "taungya," to give it in full. The word, as given in full, is a compound one, taung = a hill, ya = cultivation. Taungya cultivation is, therefore, shifting cultivation on the hillsides and corresponds, I believe, exactly with kumri, jûm, etc.

In Burma, in many of our teak reserves, we allow this "shifting cultivation" on condition that the areas so cleared and cultivated are planted up with teak (or cutch), the latter being planted by the cultivators together with the cereals or other crops raised.

It was to the counting of the plants so raised to which I referred in my letter.

PROME, 7*th Aug.* 1896. F. J. BRANTHWAITE.

Chicago Exhibition Awards.

As inquiry has been made regarding the issue of the awards of the Chicago Exhibition of 1893, the following cutting from the Birmingham *Daily Mail* of 8th July may be interesting :—

"For a go-ahead people the Yankees have not been in a hurry with the diplomas and medals gained at the Chicago Exhibition of 1893. They have taken three years to get the medals struck, and by the substitution of D for C in the Roman numerals forming the date of Columbus's landing, that interesting event is recorded as happening in 1892, instead of 1492. Presumably the work of striking them will have to be done all over again, and the happy recipients will ultimately get their medals some three years hence—about the time the next great international exhibition is due.

H. C. H.

Germination of Teak seed at Jodhpur.

Several methods were tried but the seed did not germinate, and at last, at the suggestion of Babu Mansukh Rai, Extra Assistant Conservator of Forests, the following method was tried with success.

15 seers of seed was obtained from Berar and buried in a pit 6′ × 4′ × 4′ on 25th November 1895. It was taken out on 13th May 1896 and sown in a nursery and hand-watered daily. It began to germinate on 16th June 1896 and up to date 320 seedlings have come up. Germination is still going on.

The soil of the nursery is sandy.

JODHPUR, 18*th Aug.* 1896. GOKAL DAS.

Lantana—the Forester's Friend?

I do not see why your esteemed corresdondent, C. Bagshawe, should accuse me of jesting on this sad subject. Sure nobody can have a more thorough objection to jokes—at times—than myself. I am, however, seriously obliged for the interesting extract quoted and can only hope for pardon if I suggest that the real inward gist

thereof is precisely what I said in March, *viz.*, that we do not know everything about *Lantana*, and that there is at least room for two opinions as to its possible utility in forests, if rightly used. I am quite ignorant as to who was Mr. Lawrie's predecessor, so have no idea which of the two carries the greater professional weight, but the extract from the Coorg report simply shows that Mr. Lawrie disapproves of *Lantana*, whereas his predecessor held the contrary opinion. Having had under my charge certain of these impenetrable *Lantana* jungles, I certainly never advocated sitting at ease while the *Lantana* overruns the whole country. What I still advocate is using the *Lantana* as a servant, and finding out the conditions in which it can be utilised, instead of going blindly to work trying to exterminate it by sheer expenditure of money. Rs. 17,000 have almost exterminated the plant from Berar, and it is open to Mr. Bagshawe to think that the expenditure in the future will be trifling, but it is also open to others to be less sanguine, and even to anticipate the need for a similar expenditure before say ten years are out. What have they got on the ground in place of the Berar *Lantana*? I do not know the circumstances or Berar, but if it is bare soil, I should be inclined to think the money none too well invested, while if it is grass, I should be inclined to think a good deal less of the bargain still, for it is my experience that grass is infinitely more dangerous than *Lantana*. The facts disclosed in the Coorg report do not, in my opinion, go any way at all towards disposing of the Forester's-friend theory. All they prove is that a crop of young sandalwood was allowed to be ruined by *Lantana* for want of timely care. This want of timely care is not to imply any fault of the Forest staff, being doubtless the necessary result of present conditions, but it would be equally unjust to blame the *Lantana*. What was wrong was the treatment thereof. I might venture to suggest that if the Rs. 17,000 spent in Berar had been spent in Coorg the latter might have been the richer by large areas of sandal saved till it was able to kill out the *Lantana* on its own account, while Berar might have been, as Ingoldsby says, not one penny the worse.

VELLEDA.

A new Source of Tannin.

I last year forwarded to the Director of the Dehra Dún School a sample of a cutch-looking substance which I asked him to kindly have analysed. I have just received his reply in which he says: "The Agricultural Chemist was good enough to examine the extract you sent, and reports that it contains 89·5 per cent. of tannin by Löwenthal's method." The extract was obtained for me by Maung Kale, K. S. M. of Zigon, Burma, by boiling chips of *Pyinkado* (*Xylia dolabriformis*) in the same way that chips of cutch are boiled, but I have no information as to which part of the

tree was used. Compared with cutch, which Watts says yields from 45 to 55 per cent. of tannin, the *Pyinkado* extract would appear exceedingly rich in tannin and worthy of further enquiry. Hundreds of tons of *Pyinkado* bark and sawdust are annually carted away as refuse from the saw-mills in Burma, and experiments might be carried out to see if tannin could be extracted from this waste product in paying quantities. I regret that my absence from Burma prevents me from personally prosecuting the enquiry.

BANGKOK,
11*th Septr.* 1896. } H. S.

III.—OFFICIAL PAPERS & INTELLIGENCE

Stocks Maps and Enumeration Surveys.

NOTE ON THE PREPARATION OF STOCK MAPS AND THE CONDUCT OF ENUMERATION SURVEYS, BY F. B. BRYANT, ESQ., DEPUTY CONSERVATOR OF FORESTS, CENTRAL CIRCLE.

1. It is proposed to record a few notes on the preparation of stock maps, and the system of carrying out enumeration surveys, as adopted in the preparation of the working-plans for the Kumaun, Garhwal, and Ganges Forest Divisions of the Central Circle, North-Western Provinces and Oudh.

2. The Kumaun Division was that first taken in hand, and for a long time definite conclusions were not arrived at as to the most satisfactory method of treatment to be applied to the main sal forests, which are situated on the lower slopes of the Himalayas at an altitude of some 1,500 to 4,000 feet. At first it was considered that these forests could best be treated by "Improvement Fellings" carried out with a 10 years' rotation by area only; the quantity of material being unlimited save by sylvicultural rules. With this end in view stock maps were prepared for all sal-bearing areas which had not already been examined and described during the preparation of Mr. Hearle's working-plan for the Nindhaur valley. In these maps an attempt was made to show the distribution of sal, sain, bamboos and trees of miscellaneous species by blue, red, green and black lines respectively. The density of the forest was shown by the proximity or distance of the lines apart, whilst the different age classes were represented by lines of different lengths. In the forests which were being dealt with, it was found a matter of very great difficulty, even an impossibility to prepare these maps with accuracy. The configuration of the ground, the aspect, and consequently the composition of the stock were found to vary so continually and so abruptly that to show these variations in detail was a hopeless task.

Moreover, it was found that these maps even when carefully and well done, did not, in the absence of descriptions of blocks and compartments, without enumeration surveys, afford sufficient data to enable one to draw up a satisfactory scheme of working. Thus the quantity of sound mature timber available remained altogether unknown; and even the areas in which fellings were advisable could not be distinguished. The long lines used to show the presence of mature timber, for instance in one ravine, stretched perforce over several adjoining ones in which perhaps there was no timber present; and whether the mature timber, the presence of which was thus denoted was sound or unsound, or whether it was advisable to fell it and in what quantity, there was nothing to show. The utility of such maps for irregularly stocked forests situated on broken hilly ground is therefore very doubtful, and their preparation may well be confined to more regularly stocked forests of trees of even age, where the composition and density of the coupe and the dominant age classes can be with advantage and accuracy laid down on the map.

3. It was not until much valuable time had been expended that it was decided that "Improvement Fellings" here did not satisfactorily meet the case; that there was available a considerable amount of sound mature timber, and that it was desirable to ascertain exactly where this was situated and in what quantity; that the bulk of material which "Improvement Fellings" would yield was unsaleable; that the areas to be felled over annually would be much too large, and that the only proper method of treatment was that of "selection." Accordingly enumeration surveys were carried out over all places in which mature timber, not all already enumerated, was thought to be present; and here again the stock maps first made proved of little use, and many places were enumerated which were not worth the time and money expended on them.

4. It was then that the preparation of the more useful stock maps, made for the working-plans of the Garhwal and Ganges Divisions, was taken in hand, and at the same time a description of the stock in each compartment was drawn up. The chief object aimed at in these stock maps was to show where the sound mature timber was situated, and consequently where enumeration surveys could be made with advantage; and after that to show roughly the distribution of the main types of forest growth throughout the area dealt with; and thus to enable one to classify the forests according to the method of treatment which might best be applied to each differently constituted type. The types or classes of forest recognised were—

A.—Sal forests with trees of all ages in which sound mature timber is present.

BI.—Sal forest in which there is very little sound mature timber remaining.

BII.—Sal forests principally composed of trees of the younger classes.

C.—Forest in which owing to the present condition of the stock felling cannot be recommended.

5. The stock map work should be done before the enumeration surveys are undertaken, and should be well checked by the officer in charge. It does not as a rule answer to do the stock mapping at the same time as the enumeration work, as the man in charge, anxious to get through the enumeration work as quickly as he can, or to get out of it where possible, is tempted to classify as B forest which should be classified as A.

6. In the Garhwal Division we fell into a mistake exactly in the opposite direction to that made in Kumaun, and enumerated nearly the whole area of the Kotah range before conclusions were arrived at that here "Improvement fellings" and an indefinite volume of material to be removed in them, according to the needs of the growing stock, was the correct method of treatment. But in this case there was not much cause for regret; inasmuch as the results of enumeration surveys cannot fail to be instructive and useful even where, owing to the state of the forest growth, they may not be actually required.

7. From what has been noted above it is to be concluded that it is a matter of the first importance as well as of great difficulty to settle the best method of examination of an area (especially if this be large and irregularly stocked) for which a working-plan is in contemplation. In the case of the Kumaun Division a great part of the work done during the first season was wasted.

Enumeration surveys.

8. The knowledge which we already possessed of the composition of the sal forests of Kumaun and Garhwal, gained in the preparations of and from the enumeration surveys made for Mr. Hearle's working-plan for the Nindhaur valley and Mr. Dansey's working-plan for the north Patli Dun, was considerable. In the enumeration work for these plans all sal and sain trees above 18 inches in girth had been counted. The results showed that nearly everywhere the 3rd and 4th class sal trees were very largely in excess of the 1st and 2nd class trees. Thus in the Nindhaur working circle the figures were :—

Sal.

1st class.	2nd class.	3rd class.	4th class.
27,435	61,210	169,668	249,973

and in the North Patli Dun—

Sal.

1st class.	2nd class.	3rd class.	4th class.
86,204	167,625	378,543	644,584

From this it was evident that the future of the forests was assured, and that after the lapse of a period sufficiently long to allow the 2nd class trees to become mature, the yield of the forests would be very largely increased. This being so, in the enumeration surveys made for the new plans it was considered sufficient to count the 1st and 2nd class trees only, these forming the stock of material, mature or approaching maturity, which we were justified in considering available for consumption during the period required for the constitution of a fresh stock of mature trees.

9. The best number of men for an enumeration party was found to be 12, *viz.*, two men to keep the line on either side, eight gaugemen to measure and call out the trees and two recorders to write the trees down as they are called out. As many as 20 men in line were tried, but it was found that the long line soon becomes unmanageable, and that it is not advisable to employ more than 10 men in line with the two recorders to look after them. A little drilling of the line soon brings the men into order. The two linemen should keep calling to each other so that they may keep a proper distance apart ; they should lightly blaze the trees as they pass so that there be no difficulty in finding the line again when required. The gaugemen should be taught to keep touch by the right or left as the case may be. They should march about a chain apart from each other, but this distance will vary with the density of the forest. Each tree as it is found is measured at about breast height by the gaugemen, and blazed with an axe at the place where it is measured. The gauges are divided into parts 6 inches long, each part being a different colour and representing the different classes, *viz* :—

1st Class.	2nd Class.	3rd Class.	4th Class.
Over 6′ in girth	4′6″ to 6′ in girth	3′ to 4′ 6″ in girth	1′6″ to 3′ in girth.

so that the gaugeman has but to call out the kind of tree, and the colour shown on the measuring gauge ; he also calls out whether the tree is sound or not. The men should be made to call out the tree in a loud voice, and the recorder to repeat the particulars after them ; showing that they have correctly recorded the tree called out. The best method of recording the trees was found to be by dots thus : × : each group forming 10 trees. The blazes on the trees should be made lightly on the bark, sufficiently deep

for the mark to remain for some time, but not sufficient to cause a wound to the tree. The coolies are very fond of making deep cuts into the wood if not prevented. The blazes on the trees should be made on the side, in the direction of which the party is advancing, so that a glance behind shows whether any particular tree has been counted or not.

In hilly ground the line should advance along the contours of the slopes and not up and down, as in this manner the walking is easier and more work can be done.

It was found that working with 12 men in the manner above indicated, for eight hours a day, an average area of 100 acres could be surveyed.

10. To ensure the accuracy of enumeration surveys is a difficult matter. There are many causes of error such as—

(*a*) mistakes may be made in the boundaries of compartments ;

(*b*) trees are left out owing to the men in the line getting too far apart ;

(*c*) mistakes are made in classifying the trees into sound and unsound ;

(*d*) forest, the trees in which ought to be counted, is omitted altogether, owing to wrong classification, or laziness ;

(*e*) the men for pure mischief will call out trees which do not exist.

11. In order to test the accuracy of the work check surveys must be frequently carried out. To enable these to be done without too much expense of money or time, the forest should be divided up into compartments or sub-compartments of not more than 300 acres; better even smaller; for to check a compartment of 300 acres will take at least three days, when there are many hands at work. It is a good plan to have a separate gang of men under a reliable officer employed entirely on checking the work of others.

12. The classification of the trees into sound and unsound is a fertile cause of error, and this alone may often vitiate the calculations made in a working-plan. A tree which appears perfectly sound from outside, and which rings true to the blow of an axe, not unfrequently proves rotten and useless when cut. One can but continually impress upon the men the importance of correctly classifying the trees. Another point is that trees though not hollow may be so crooked and stunted as to be quite useless for timber ; all such trees should be written down unsound.

13. The pay of line and gaugemen was Rs. 5 a month during the cold weather, November to March, and Rs. 6 during April and May, during which months it is very difficult to keep the work going. The recorders were paid Rs. 8 to Rs. 10 a month. When a forest ranger was in charge he himself acted as a recorder.

The average expenditure per 100 acres enumerated has been calculated to have been Rs. 3-12-0, exclusive of the salaries of forest rangers and other subordinates employed.

NAINI TAL : *The 5th June* 1896. } F. B. BRYANT, *Dy. Consr. of Forests, Kumaun Divn.*

Woods suitable for the Manufacture of Matches

From—H. D. BANERJEE, Secretary to the Bengal Safety Match Manufacturing Company, Limited, to the Conservator of Forests, Bengal.

With reference to your enquiry No. 57-T-P.—M., dated the 1st instant, and its reminder No. 57-T. P. M.—R. I., dated the 15th instant, I have the pleasure to inform you that, out of the various samples of timber so kindly sent us by your constituents, only the following have been found suitable for the purpose of manufacturing matches with ; and the supply rates of them only are, therefore, earnestly requested for :—

Name of timber.	Despatched by
Elæocarpus robustus ...	Deputy Conservator, Kurseong Division, Sukna.
Evodia fraxinifolia ..	Ditto. Ditto. Ditto.
Abies Webbiana ...	Forester, Singalila Range.
Juniperus recurva ...	Ditto Ditto
Alnus nepalensis ...	Forest Ranger, Goompahar Range.
Magnolia Campbellii ...	Ditto. Ditto.
Heptapleurum elatum ...	Range Officer, Senchal Range.
Sambucus javanica ...	Ditto. Ditto.
Symplocos lucida ...	Ditto. Ditto.
Ditto ramosissima ...	Ditto. Ditto.
Gmelina arborea	Forest Rangers, Porahat Range & Samta Range.

Provident Fund for Forest Officers.

From—The Conservator of Forests, Hyderabad Assigned Districts, to the Comptroller, India Treasuries, Calcutta.—Dated 11th July 1896.

With reference to Government of India, Finance and Commerce Resolution No. 2881 P., dated 1st July 1896, I have the honour to enquire whether the compound interest referred to in the Forest Officers Provident Fund rule II (4) will be credited annually on the monthly payments ; *i. e.*, suppose interest is credited on 1st July 1897, will the payment of 1st August be allowed interest for 11 months ; 1st September for 10 months ; 1st October for 9 months, and so on, or what will be the procedure as to crediting interest ?

I ask as the point is one of interest to all the Forest officers in Berar, and when issuing the Resolution I wish to give them definite information as to how interest will be credited.

From—The Comptroller of India Treasuries, to Conservator of Forests, Hyderabad Assigned Districts.—Dated 17th July 1896.

With reference to your letter dated 11th July 1896, I have the honour to state that interest will be calculated monthly upon the minimum balance at credit of subscribers between the close of the 4th day and the end of the month, but will not be added to

the principal until the end of the Official year as laid down in Rule XI of the Fund Rules issued with Financial Resolution No. 2881 P., dated 1st July 1896.

A sample form showing the method of calculating interest is herewith enclosed for your information.

*Name*_____

Month.	Amount of monthly deposit.	Withdrawals.	Monthly balance on which interest is calculated.	Interest at 4 p. c. per annum.
Balance of last year Brought forward				
August 1896 ...	25	... .	25	... 1 4
September 1896 ...	25	... .	50	.. 2 8
October ,, ...	25	10	65	... 3 5
November ,, ...	25	... .	90	... 4 9
December ,, ..	25	15	100	.. 5 4
January 1897 ...	25	... ...	125	... 6 8
February ,, ...	25	... ...	150	... 8 ...
March ,, ...	25	... ...	175	... 9 4
			.. ...	
Rs. ...	200	25	... ...	2 9 6

IV.—REVIEWS.

Annual Forest Administration Report for Burma for 1894-95.

The progress made in reservation of forests amounted to a net increase of 1,039 square miles, in which are included 89 square miles set apart for *taungya* cutters.

"The Government of India notice with satisfaction that this system of providing circumscribed and well-defined areas within the reserve boundaries, for the *taungya*-cutting population found to exist at the time of settlement, continues to meet the difficulty of dealing with the tribes most wedded to this kind of cultivation. The Burma reserves, amounting to a gross area of 18,479 square miles, now contain 798 square miles of *taungya* areas, over which the hill tribes can practise, almost unchecked, their original method of cultivation; while the remaining area can be conserved as strictly as may be required. These figures speak for themselves, and show that Government has acquired a permanent forest property of constantly increasing value; and that, without any impolitic interference with the people in the exercise of what must

necessarily be a more or less destructive method of cultivation, they have succeeded in checking its further spread at the cost of valuable forests."

"The Government of India, whilst fully acknowledging the care and foresight with which forest-settlements in Burma have almost invariably been made, recognise that the satisfactory nature of the results is in great part due to the fact that the Karens have ever since found profitable employment in forest work, and especially in cultural operations, such as teak and cutch *taungyas*, in which their own method of cultivation has been utilized for the benefit of the forest. The fact that nearly 40,000 acres of such *taungyas*, the result of the last 22 years' work, existed at the end of the year under review, and that for their formation alone the people, who previously enjoyed but small opportunities of earning money, must have received at least six lakhs of rupees, shows how considerable are the benefits which they have derived from the system."

The area planted up on the *taungya* system during the year amounted to 1,644 acres.

The effects of constant *taungya* cutting and burning the forests are beginning to be felt by the people of the Thayetmyo District, and the following remarks of the Chief Commissioner on this subject are of great interest:—

"Nor is the destruction of cutch the only evil caused by *taungya* cultivation. In Thayetmyo especially, the impoverishment of the soil and the acceleration of the floods in the streams, from which water for irrigation cannot be taken with the same ease as formerly, are ascribed to the same cause. In other countries, as population increases, the lower hills have had to be terraced for permanent cultivation, and this is the work which the cultivators of Thayetmyo will have to undertake, if they are unwilling to move to the delta. The Chief Commissioner is not blind to the political drawbacks of measures, however beneficial, of which the people do not understand the advantage, but he is convinced that some check must be applied, gradually and cautiously, to shifting cultivation, and he hopes to alleviate the concomitant hardships by encouraging cultivators to undertake permanent cultivation and assisting them to do so by means of agricultural loans."

The Government of India in commenting on these remarks arrive at the same conclusion; they "favour, so far as this is feasible, a policy of non-interference with the agricultural habits of the people outside of the forest-reserve boundaries. In Burma, however, the work of reservation has not as yet been completed, while the *taungya* cultivation in the dry hills of Prome and Thayetmyo has proved itself hostile not merely to forest reservation and consequently to cutch-boiling, one of the most paying industries in that part of the country, but even to agriculture itself, by impoverishing the soil and accelerating the floods in the streams. Under these circumstances the Government of India are constrained to agree with you

that if the area of reserves within which extensive rights are admissible cannot be considerably enlarged, and *taungya* cultivation thus restricted within limited areas, some other check of a more general character must gradually be applied so as to confine shifting cultivation within areas set apart for this purpose."

Satisfactory progress is recorded under head of Surveys, the area completed by the Survey of India parties and the Forest Survey Branch, aggregating 4,479 miles.

The area successfully protected from fire was 939 square miles, compared with 585 square miles in the previous year. The increase was principally in Upper Burma, particularly in the Western Circle, where there are apparently large areas that can be protected from fire at a trifling cost. The distribution of fire-protected areas is shown below :—

	Area protected in 1895. Square miles.	Approximate cost per square mile. Rs.
Tenasserim Circle	255	65
Pegu „	295	56
Eastern „	68	45
Western „	321	2-8

The total area protected, however, only amounts to 7 per cent. of the reserved forests, which, considering the value of the forests and the enormous revenue derived from them, cannot be regarded as satisfactory.

The difficulties in regard to fire-protection in Burma are due principally to want of sufficient establishment, scarcity of labour, the high cost of the same (coolies' wages vary from 8 annas to one rupee a day) and the nature of the forests, which for the most part continue to shed their leaves all through the dry weather, thus entailing constant sweeping of the fire-lines. In order to to keep expenditure within reasonable bounds the fire traces have necessarily to be made of the smallest possible dimensions and the number of fire watchers reduced to a dangerously low number. In Burma, therefore, much more is left to chance and to the goodwill of the people than is elsewhere the case, and the wonder is that fire-protection has been as successful as it has. It is not easy to say how the cost could be reduced, but with the aid of the new maps now available something might possibly be done by a realignment of the fire traces and an extension of the areas under protection so as to include more compact blocks.

The Pegu report contains certain observations by the Divisinal Officer, Tharrawaddy, on the effects of fire protection and its influence on natural reprotection which have already been quoted in the *Indian Forester* (page 302). The Local Government in their resolution on the report called for the opinion of other officers and we are now able to reproduce the following interesting remarks by Mr. Nisbet, Conservator of Forests and the Divisional Officers of the Pegu Circle.

"The whole question is one of very great importance to the Forest Department in Burma; and, if I had leisure to deal with it *in extenso*, I would not either begin or limit myself with the consideration of the five points referred to by Mr. Slade."

"During the torrential rains of the south-western monsoon in Lower Burma the softest top layer of soil on the hill-sides is washed away for a depth varying from 1 or 2 to 3 or 4 inches, save only where protected by short soil-covering or even by small stones often found topping stalagmite-like pinnacles of soil in the succeeding dry weather. To counteract this and to produce good surface soil as speedily as possible, nature appears to have made the wonderful provision of ordaining that countless millions of earth-worms, ants, beetles and other insects, &c., should have the power of consuming such forest *débris* as fallen stems, dead wood, leaves, &c., and, after extracting their requisite nourishment from it, of emitting the fæces not in the form of more or less altered organic matter but as a very fine, pure, and fertile loam. Throughout the whole year some or other of these myriad of animals are at work converting the *débris* of trees into good soil to replace what has been or is being washed away by the heavy rainfall, but the greatest activity seems to be at the termination of the rains and at the commencement of the wet season."

"The annual washing away of the surface soil in dry hill forests and the activity of earth-worms, insects, &c., combine to render the formation of humus in such tracts almost impossible. At any rate, careful observations in the Thayetmyo and Prome Divisions, and in the North Subdivision Tharrawaddy throughout the past camping season failed to bring true humus to my notice in dry hill forest tracts protected from fire."

"This therefore disposes of Mr. Slade's statements, (*a*) and (*b*) "that fire-protection permits the formation of humus" and "that this humus forms a better seed-bed;" and these were the main points at issue. The correct expression to have used would be that *fire-protection tends towards the formation of humus*, and the advantages of humus are well-known to every trained forester."

"Mr. Slade's statements (*c*) and (*d*) are practically correct but they may be collated with Mr. P. J. Carter's remarks in paragraph 27 of his *Report on Forest Administration in the Pegu Circle*, 1892-93.*"

* "In the drier forests where the prevalent bamboo is *myinwa (Dendrocolamus strictus)* which flowers in patches almost every year, the natural reproduction of teak and other species is fairly good, and in such forest fire-protection not only improves the forest growth generally, but furthers the natural reproduction of teak. In the moister forests where the prevalent bamboos are *Tinwa (apholostachum pergracile)* and *kyathaung (Bambusa polymorpha)* which do not flower spasmodically, natural reproduction is confined to gaps in the bamboo canopy, which are not of frequent occurrence. In this forest fire-protection improves the general forest growth and has a marked effect on the distribution of the water-supply, but it is not favourable to the natural reproduction of teak. The probable effect of continued fire-protection would be to increase the area of evergreen forest in which teak would not find a place if the forester trusted to natural reproduction alone."

"Statement (*e*) is merely a reiteration of what is well known with regard to the effect of fire on teak. My observations in the Thayetmyo cutch and teak plantations go, however, to prove that on soils and situations better suited for cutch than teak, the latter species suffer more from fire than the former; but in Tharrawaddy, where the conditions as to soil and situation are more favourable for teak, it is not surprising that cutch is there more injuriously affected. It may be of interest to note that teak, after remaining long suppressed by shade, possesses great power of recuperation when finally admitted to the benefits of light and air. In this respect it resembles the silver-fir of Europe; and to this cause may probably be due its power of establishing and finally asserting itself at each generation of the *kyathaung* (*Bambusa polymorpha*) bamboo, when all the culms overtopping it die off after seeding."

Extract from Inspection note by Mr. Nisbet.

The south-eastern portion of the Chaungzauk working circle has been successfully protected against fire for the last 16 years (since 1879), and the effects are very apparent in the strong contrast between fire-protected forest and those outside which are already, even so early as 5th January, either leafless or else are fast shedding their dry, yellow foliage, whilst the teak trees in the reserve are still in almost full leaf of a healthy green colour. This prolongation of the active season of vegetation must considerably influence the annual increment on the boles on the teak trees."

"I also note, however,—and the observations of the Deputy Conservator of Forests corroborate my own—that the teak trees inside the fire-protected area do not seed anything like so freely as those outside; and this may—though to a certain extent only, for the absence of soil-covering is also of great importance—account for the indisputable fact that natural regeneration of teak appears to be usually much better in unreserved forests than in the fire-protected reserves."

Criticism of the Deputy Conservator of Forests, Tharrawaddy, on Mr. Slade's statements.

"(*a*) The formation of humus in the forests of Burma never takes place except in the extreme type of evergreen forest, and although I have often searched for it diligently I have never found it except in the Thandaung forests of the Toungoo Division. At the beginning of the rains insects innumerable, especially white-ants, appear and earth-worms come up The whole of the rotting leaves are consumed by these, and after they have passed through them an examination of the excreta will show that the leaves and other *débris* have been decomposed into the original soil such as it was before its components were taken up for the formation and nourishment of the living vegetable matter.

(*b*) If humus existed it no doubt would form an excellent seed-bed, but in its absence there is no better seed-bed than a thick layer of ashes. It should, too, be borne in mind that insects are much more numerous in fire-protected forests and that although more good seed may remain on the ground owing to the absence of fires, yet the numerous insects will destroy a very large proportion of it.

(*c*) and (*d*) These two statements are, I believe, correct and are fully borne out by my observations.

(*e*) I do not think that teak suffers more than cutch, especially in plantations, as I have inspected a considerable area of plantations of mixed teak and cutch, and I have found that whilst many of the teak plants have had their terminal shoots killed the cutch plants have been in no way injured."

Criticism of the Deputy Conservator of Forests, Prome.

"Theoretically, of course, fire-protection, if successful, should promote and permit the formation of humus. Unfortunately, as far as I have been able to observe in the Prome Division, it does not do so at all. Soon after the commencement of the rains I noticed last year, in the Chaungzauk reserve, that white-ants eat up all the leaves and dead grasses that were lying about. In other parts of this division, too, I have noticed that decaying vegetation, sticks, logs, &c., are permeated with white-ants and earth-worms, &c. The result is not humus, though I have no doubt that much matter is worked into the soil which is thereby improved. In parts of the Chaungzauk reserve which have been successfully fire-protected for 16 years now, though the forest is moister than the parts which have not been protected, I have failed to notice that humus has been formed.

The absence of fires of course prevents the hard baking of the soil into bricks.

(*b*) Were humus present naturally there would be a better seed-bed and one too from which the seeds would bear less chance of being washed away at the first burst of the monsoon as is too often the case. Fire-protection does tend to prevent this washing away of the seeds; but my reason for making this statement is a different one to Mr. Slade's, with whom I totally disagree about the formation of humus, at least as far as the Prome division is concerned. Fire-protection prevents the leaves, grass, &c., being burnt, and as they are not eaten and worked into the soil until after the first burst of the monsoon the seeds find a lodging amongst these leaves, grasses, &c., and are retained and germinate even under a thick canopy of bamboos. Outside fire-traced areas the soil is baked hard and the leaves, &c., burnt; the sequel is that the first rain rushes down bearing most of the seed before it into the nullahs, as it finds no lodging except here and there in depressions or cracks in the soil, hence most of the seed is lost.

(*c*) } I agree with Mr. Slade's remarks under these.
(*d*) }

It is a very noticeable fact in this division that outside fire-traced areas, where the canopy is very light owing to the jungle being yearly burnt over, the natural regeneration of teak is better than in the fire-traced areas. Again, inside such areas regeneration of all light-demanding species, such as teak, *pyinkado* (*Xylia dolabriformis*) and cutch, is infinitely better in *myinwa*, which flowers sporadically, than in *kyathaung* forest, where the shade is denser and the light is not let in by sporadic flowering. The significance of this is emphasized by the fact that *kyathaung* grows on moister and better soil than *myin*, where the seedlings would have, *cœteris paribus*, a better chance of flourishing.

(*e*) I agree with the first part of the subhead. With reference to the last paragraph, however, I cannot agree. Cutch and *pyinkado* seedlings are very often—generally I might say—burnt down, but they as a rule spring up again the next year, sending out stronger shoots than before. This is especially the case with cutch, though it is also true, but to a less extent, with *pyinkado*."

Criticism of the Deputy Conservator of Forests, Thayetmyo.

"I can call to mind no definite localities in this district where fire-protection has caused the formation of humus; but I attribute this to the fact that fire-protection has only been started a short time here, and that most of the areas I inspected were burnt over last year."

Criticism of the Deputy Conservator of Forests, Pegu.

"I have never found humus in dry forests as the result of fire-protection."

Criticism of the Assistant Conservator of Forests, Rangoon.

"I have the honour to report as follows as the result of an inspection made this day in plantations of 1876, 1875, and 1874.

Kaingpadi, 1876.—Last March's layer of dead leaves still lying, but beyond that no decomposing vegetable matter at all. Immediately under the dead leaves is the natural soil, here almost pure sand, the top, if anything, of a lighter colour than that underneath, but of the same composition. In one place among the dead leaves a mass of soft mud was found similar to worm excrement.

1875 and 1874 then examined; soil rather more clayey than the 1876, and sometimes of a darker colour, but no trace of humus proper, the last fall of dead leaves being the only organic layer present.

The ranger states that by the end of October usually the layer of dead leaves has disappeared, devoured, and transformed by white-ants or other insects. At this time I could see nothing of any white-ants, only swarms of small yellow ants among the leaves. These plantations above mentioned have been successfully protected from fire for 20 years or more, and the cover is dense and complete. If humus is to be found anywhere in plantations it should exist here. The older plantations, 1873 and 1872, were not visited, as they are more low-lying and nearer the Magayi stream than those reported on above, and the surrounding forest is more or less evergreen in places."

From the above and other observations that have been recorded in the *Indian Forester* it appears that under ordinary circumstances, no formation of humus takes place in teak forests protected from fire, and consequently the soil does not derive the benefit of the physical properties ascribed to humus. The soil is nevertheless to a considerable extent protected from evaporation during the hot weather by the dead leaves lying on its surface, which remain undestroyed until the herbaceous growth, usually formed during the rains in such forests, has sprung up, thus preventing in a great measure the erosion of the soil, which is so great an evil in forests subject to annual fires. It has also been shown that the dead leaves although they do not form humus are when protected from fire rapidly restored to the soil in a form in which they can easily be assimilated by plants. The value of fire-protection in improving the growth of the forest is unmistakably shown in the prolonged period of active vegetation to which Mr. Nisbet draws attention, which, as he says, must considerably increase the annual increment of the trees. The earlier and more profuse seeding of teak trees noticed in unprotected forests is, on the other hand, most probably a sign of arrested growth.

The value of a dead teak tree, as it stands in the forest, is from Rs. 20 to Rs. 30, and when it is considered that not only are a great number of such trees destroyed annually, but that also an immense quantity of seedlings and growing trees are cut back or permanently injured, there can be no doubt that fire-protection, even at its present high cost, is a profitable investment, especially in the dry forests, which are far more extensive than those of a moist type. Judiciously used, however, fire is on occasions an indispensable agent in securing the regeneration of teak forests and we quite agree with the following remarks taken from the Government of India Resolution.

"It is a fact of great importance that some of the constituents of the Burma forests, and especially the teak which represents their main wealth, should be less affected by forest fires than most other trees, and the natural reproduction of this species should be in some degree favoured in its struggle against others by an occasional forest fire. It has been for years a well known fact that

natural reproduction of teak in a fire-protected forest, especially if in a moist position, labours under difficulties which do not exist in areas subject to fires ; and it has also been frequently found that occasional fires which have run through plantations or teak *taungyas* have caused no visible permanent damage. On the otherhand, it cannot be gainsaid that countless seedlings, even of teak, are destroyed by recurring conflagrations, while the unsoundness which characterises so much of the mature timber is due to no other cause."

"The controlled use of fire in teak *taungyas*, or in assisting teak reproduction in areas over which the bamboo has seeded, even within fire-protected tracts, is already resorted to; but in drawing the sweeping conclusion 'that fire-protection would appear to be detrimental to the natural regeneration of teak if carried out strictly year after year,' there is, the Government of India fear, a danger that the necessity for control over the use of fire in favouring such regeneration should be lost sight of."

The financial results of the year are as follows :—

	Forest year.	*Financial year.*
Receipts	Rs. 55,95,886	Rs. 54,36,782
Charges	„ 18,64,502	„ 19,20,774
Surplus	„ 37,31,385	„ 35,16,008

"The gross and net revenue showed a decrease of Rs. 3,48,318 and Rs. 4,06,582, respectively, if compared with the exceptionally high figures of 1893-94, but were in excess of the averages of the ast five years by Rs. 4,58,129 and Rs. 2,09,738 respectively."

VI.—EXTRACTS, NOTES AND QUERIES.

The Forest Department Pension Rules.

The *Gazette of India* of the 22nd instant contained the announcement that Conservators of Forests, 1st grade, are eligible for an additional pension of Rs. 1,000 a year, provided they shall have rendered not less than three years' effective service in the appointment, and that during this time they shall have shown special energy and efficiency. This partial concession of what Forest officers consider their just claims does not settle the question satisfactorily. The Secretary of State in his despatch to the Government of India, dated December 26th, 1895, stated that "the Forest officers whether at present in your service, or hereafter to be appointed, will be entitled, if re-

commended for special merit, to an extra pension of Rs. 1,000 per annum after three years of approved service as the head of the department in any province." This ruling was received with gratification by the Forest Service throughout India, and if it had been acted up to everyone would have been content. But the present Resolution sadly curtails the concession. There are in India and Burma, at the present moment, only six Conservators of the 1st grade out of a total number of nineteen. All Conservators are, however, heads of departments—officially recognised, addressed and treated as such—in their several provinces, in relation to the Civil Service Regulations and otherwise. It is impossible to reconcile the present order with the Secretary of State's despatch of December last, or with his statement in Parliament made in answer to a question put by Sir Richard Temple on July 31st, 1894. That question was:—"Whether the concessions, including special pensions to Conservators and the Inspector-General, had been granted to officers now in the Forest Service and to those to be appointed hereafter?" The answer given was as follows:—"In a despatch of September 13th, 1893, the Secretary of State authorised the grant to Forest officers, appointed from England, of pensions on the same terms as are permitted in the case of civil engineers, up to a maximun of Rs. 5,000 a year, with an addition of Rs. 1,000 in the case of officers who shall have rendered not less than three years' approved service, *as the head of the department in any province*, and whose special merits may be considered to be deserving of such a concession." It is hardly conceivable that Parliament will permit even a Secretary of State for India to make a deliberate public statement and then quietly ignore it.

A short time back we drew attention to the handsome surplus accruing to the State from forests in the year 1895-96, and the comparative figures may now be given in detail. The provinces under the control of the Government of India, Madras and Bombay being excluded, yielded the following surplus during the quinquennial periods mentioned:—

1870-71 to 1874-75	...	Rs. 11,12,000
1875-76 to 1879-80	...	,, 17,18,000
1880-81 to 1884-85	...	,, 23,86,000
1885-86 to 1889-90	...	,, 38,42,000
1890-91 to 1894-95	...	,, 53,51,000

In the year which has just passed the surplus was Rs. 58,41,000. Madras and Bombay may be taken as giving at least 22 lakhs, so we have a net surplus for all India and Burma of about 80 lakhs of rupees. In years to come it will doubtless rise to a crore, for Upper Burma has by no means reached its limit of production, and as the country is opened out the revenue must expand. The Forest officers, to whose energy and ability this development is due, as a whole lead hard lives, with a good

deal of exposure and a good deal of solitude, often in unhealthy climates. But even if their lines were all cast in as pleasant places as those of the lucky few, it would be no reason for meanly wriggling out of a concession that has publicly been granted and announced.—*Pioneer.*

At a meeting of the Civil Engineers Association, held in Messrs. Grindlay and Co.'s rooms, 55, Parliament-street, on the 28th instant, attention was drawn to Lord Kimberley's despatch of Sept. 21, 1893, which withdrew the additional pension of Rs. 2,000 hitherto granted to chief engineers. It was pointed out that the Civil Service Regulations have not yet been altered in accordance with that decision; that the Coopers Hill prospectus still refers candidates to the College Calendar for particulars regarding "the pay and the leave and pension rules of the Indian Government Service up to the latest date received"; that the Calendar for the year 1894-95, issued a year after the date of Lord Kimberley's despatch, holds out the inducement of the additional pensions of Rs. 1,000, and Rs, 2000, although the edition for the current year omits all mention of those pensions; and that the despatch has never been officially published. Consequently all students who have entered the College up to the present time will have an indisputable claim to the additional pensions should they ever attain the rank of Superintending or Chief Engineer in the P. W. D. In consultation with the Committee of the European Civil Service (Indian Uncovenanted) Association, questions will be asked in the House regarding this matter, which affects the Public Works Department. When the Coopers Hill men of the years 1870 to 1874 claimed the par rate of exchange, it was decided that the promises held out in the prospectus and Calendar formed practically an integral part of their Covenant, notwithstanding the fact that alterations had been made in the Civil Service Regulations. Therefore the students who enter the College this year will have a far stronger claim to the additional pensions, seeing the Regulations still promise those pensions although the Calendar is silent on the subject.—*Home News.*

With reference to the paragraph under the above heading in the *Home News* of the 31st July, we have now to announce that Mr Maclure, on the 13th August, asked a question in the House regarding the withdrawal of the special pensions of Rs. 2,000 per annum granted to certain officers in the Public Works, the Indian Telegraph, and the Forest Departments. Lord George Hamilton replied as follows:—"The exceptional pensions, which were sanctioned in 1883, are not to be granted in the Public Works Department in future, because the special circumstances, which were then held to justify them, no longer exist. The despatch does not affect any officers who were already in the Service at the time when it was written, and the case of those who may have entered since that

date, but before its publication, has been provided for. The correspondence relating to the discontinuance of further grants of these pensions is contained in the Return recently laid on the table." We understand that the whole correspondence regarding the so-called "Uncovenanted" Services went to the printers on the 13th August. Although of great bulk, it will not take long to print, we are told, and it will then be at once distributed. We are curious to know how the case of those who have entered the Service since the 21st September 1893 has been provided for. If the provision made by the Secretary of State does not meet the equity of the case, more will be heard on the subject.—*Home News.*

The Forest Department Pension Rules.

Notification No 3597-*P., dated the* 21*st August* 1896.—*Resolution by the Government of India, Finance and Commerce Department.*

READ—

Resolution in the Finance and Commerce Department, No 2958-P., dated 22nd June 1895.

Despatch from Her Majesty's Secretary of State for India, No. 188 (Financial), dated 21st September 1893

Despatch to Her Majesty's Secretary of State. for India, No. 77, dated 25th March 1896.

Despatch from Her Majesty's Secretary of State for India, No. 109 (Financial), dated 9th July 1896.

RESOLUTION—The Governor-General in Council is pleased to announce that Her Majesty's Secretary of State has decided that officers of the Forest, Public Works and Telegraph Departments, holding any of the appointments enumerated in the following list and belonging to what was formerly termed the Uncovenanted Service, shall be eligible for an addditional pension of Rs. 1,000 a year, provided they shall have rendered not less than three years' effective service in the appointments and provided also that in each case during such service the officer has shown such special energy and efficiency as may be considered to be deserving of the concession :

FOREST DEPARTMENT.

Conservators of Forests, 1st Grade,

PUBLIC WORKS DEPARTMENT.

Secretary to the Government of India, Public Works Department.

Director-General of Railways and Deputy Secretary, Public Works Department, Railway Branch.

Inspector-General of Irrigation and Deputy Secretary, Public Works Department, Civil Works Branch.

Accountant-General, Public Works Department, and Deputy Secretary, Public Works Department, Accounts Branch.

*All Chief Engineers and Officers of corresponding rank in the several branches of the Public Works Department.

TELEGRAPH DEPARTMENT.

Director-General of Telegraphs in India.

Director-in-Chief of the Indo-European Government Telegraph Department when the office is held by a member of the Indian Telegraph Department.

Deputy Director-General of Telegraphs in India.

To the above should be added any officers graded as Chief Engineer and seconded from the Public Works Department holding appointments of corresponding rank and responsibility in foreign service.

**Detailed list of appointments referred to under Public Works Department as at present held.*

Madras ...	Chief Engineer and Secretary,	Public Works Department.
Ditto ...	Ditto	and Joint Secretary, Public Works Department.
Bombay ...	Ditto	and Secretary, Public Works Department.
Ditto ...	Ditto	Central Division.
Bengal ...	Ditto	and Secretary, Buildings and Roads Branch.
Ditto ...	Ditto	ditto, Irrigation Branch.
N. W. P. and Oudh	Ditto	ditto, Buildings and Roads Branch.
Ditto	Ditto	ditto, Irrigation Branch.
Punjab ...	Ditto	ditto, Buildings and Roads Branch.
Ditto ...	Ditto	ditto, Irrigation Branch.
Burma ..	Ditto	ditto, Public Works Department.
Central Provinces or Assam	Ditto	ditto, ditto ditto.

(Either of these, but not both at one time, may be held by a Chief Engineer.)

†Railway Branch—

Consulting Engineer to Government of India for Railways.

Manager, North-Western Railway.

Consulting Engineer of any constituted circle, when the appointment is held by a Chief Edgineer.

Engineers-in-Chief of Railways under Survey, Construction, or Open, when the appointment is held by a Chief Engineer.

† N. B.—The present sanctioned number of appointments carrying the rank of Chief Engineer in the Railway Branch is six.

2. Provided the necessary conditions are fulfilled, the additional pension of Rs. 1,000 a year now sanctioned will, in the case of the Public Works and Telegraph Departments, be admissible to all officers who entered the service on or after the 11th October 1893, and such of the officers who entered before that date as do not become eligible on retirement for the pensions mentioned in Article 714 of the Civil Service Regulations.

3. Under the orders of Her Majesty's Secretary of State contained in paragraph 10 of the Despatch of the 21st September 1893, quoted in the preamble, officers of the Public Works and Telegraph Departments who entered the service on or after the 11th October 1893 (the date on which the despatch was received by the Government of India) are not entitled to the special additional pensions of Rs. 1,000 and Rs. 2,000 a year mentioned in Article 714 of the Civil Service Regulations.

Prize Day at Coopers Hill.

The results of the annual examination 1896, so far as the Forest Department is concerned, are as follows :—

Appointed Fellow of Coopers Hill	R. S. Hole.
Prize for Forestry and Forest Law	R. S. Hole.
Scholarship in the Forest course (2nd year Students)	R. S. Troup.

The following have been appointed Assistant Conservator of Forests, 2nd grade :—

R. S. Hole.	...	...	E. M. Hodgson.
D. O. Witt.	...	...	T. S. Scott.
F. F. R. Channer.	...	...	
W. A. R. Doxat.	...	...	T. H. Monteath.
G. E. S. Cubitt.	...	...	J. C. Carroll.
G. K. Parker.	...	...	C. B. Dawson.

Result of the Examination for Admission to the Police and Forest Services.

The results of the recent examination for admision to the Police and Forest Services are given below. Judging from the marks it would appear that the former is decidedly the more popular of the two.

Indian Police Force—The following are declared by the Civil Service Commissioners to have obtained the first nine

places in order of merit in the recent open competitive examination for nine appointments in the Indian Police Force. Marks as appended :—

Coupland, Richard Ernest	... 7987	Simpson, Trevor Claude	... 7136
Cooks, George Arthur	... 7878	Hamilton, Frederick Arnold	... 7099
Hayter, Owen Chilton Goodenough ...	... 7599	M'Carrison, David Lawlor	... 6980
Hart, Ernest Grey	... 7476	Reinold, Kenneth Arnold	... 6905
		Scotney-George, Frank Seaver	... 6616

Indian Forest Service.—The following are declared by the Civil Service Commissioners to have obtained the first six places in order of merit in the recent open competitive examination for six appointments in the Indian Forest Service. Marks as appended :—

M'Kenzie, Charles Stuart	... 7180	Dunbar Brander, Archibald Alexander ...	... 6173
Marjoribanks, George Erskine	... 7161	Dobrée, Richard Harry Bonamy Melville ...	... 5847
Welsh, Hugh Laurence Peregrine ...	... 7089		
Walker, Herbert Comyn	... 6386		

The New President of Coopers Hill.

The appointment of Colonel John Pennycuick, C. S. I., to succeed Sir Alexander Tayler at Coopers Hill will be recognised everywhere as a judicious selection. Sir Alexander is a hard man to replace in any capacity, but the most popular of Madras Colonels is sure to make an excellent successor. Colonel Pennycuick joined the Madras Engineers in 1855, and when he retired he was the last man of the old corps still on the active list. He had the reputation of being a first-rate head of the Public Works Department in Madras, and he would seem to be equally cut out for his new appointment. Coopers Hill in these days is a good deal more than an Indian Engineering College, and something besides pure engineering eminence is required in its President. Colonel Pennycuick withal is hardly more renowned as an officer than as a cricketer, an accomplishment which will not serve to alienate him from the young men under his charge.—*Pioneer.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

5th August 1896.

EAST INDIA TEAK. The deliveries for the first seven month of this year amount to 12,070 loads against 9,246 loads for the same period in 1895. In July this year they have been 1,609 loads against 1,268 loads in July 1895. The business of the month has been satisfactory both in extent and with regard to the prices obtainable. There is every indication of steady markets for a long time to come, the rise established at the beginning of the year being now proved to be justified by the wide spreading nature of the demand, and sellers being content not to check consumption by straining rates still higher.

CEDAR, EAST INDIAN. Are in good demand, and the small lots offering have sold well.

ROSEWOOD, EAST INDIA. There is some enquiry, and good logs, in small parcels, would realize satisfactory prices.

SATINWOOD EAST INDIA. Is rather scarce, and good logs or figury boards would sell well.

EBONY EAST INDIA. There is a moderate demand for really good wood, and the stock is limited to one parcel just arrived.

PRICE CURRENT.

Indian teak	per load	£10-10s.	to	£15	10s.
Rosewood	„ ton	£6	to	£10	
Satinwood	„ sup. foot	8d.	to	12d.	
Ebony	„ ton	£6	to	£8	

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, August 1896.

Cardamoms	per lb.	1s. 1d.	to	2s.	8d.
Croton seeds	per cwt.	66s.			
Cutch	„	17s.	to	32s.	6d.
Gum Arabic, Madras	„	45s.	to	65s.	
Gum Kino	„	£20	to	£25.	
Indiarubber, Assam	per lb.	1s. 10d.	to	2s.	3½d.
„ Burma	„	1s. 4d.	to	1s.	11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.	
„ Jubbulpore	„	3s. 9d.	to	6s.	
„ Godavari	„	2s. 6d.	to	4s.	6d.
Nux Vomica, good	„	6s.	to	7s.	6d.
Oil, Lemon Grass	per lb.	2⅜d.			
Orchella, Ceylon	per ton	11s.	to	15s.	
Sandalwood, logs	„	£30	to	£50	
„ chips	„	£4	to	£8	
Sapanwood, Madras	„	£4	to	£6, Nom.	
Seed lac	„	70s.	to	95s.	
Tamarind	„	6s.	to	7s.	

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, Bareilly, and Delhi, for the month of July 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10 Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sál and Sain, &c., Karis 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0			
{ Sain	30 0 0	40 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sál, 10′ Tors (Poles) ...	30 0 0	60 0 0	...	...	
Sál and Sain, &c., Karis 12′ × 5″ × 4″ ...	25 0 0	35 0 0	..	...	
Sál bed posts, 7′ × 2½″ × 2½″ ..	4 0 0	5 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	33 0 0	{ 80 0 0 / 400 0 0	
BAREILLY.					
Sál, 10′ Tors (Poles) ...	5 0 0	10 0 0	...	..	
Sál and Sain, &c., Karis, 12′ × 5″ × 4″	{ 25 0 0 / 40 0 0	{ 35 0 0 / 50 0 0 / 60 0 0	... / ...	.. / ..	
Sál bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0			
Bamboos of 9′ to 10′ per 100 score ...	..	...	50 0 0	137 0 0	
DELHI.					
Sál, 10′ Tors (Poles) ...	7 0 0	10 0 0	..	...	
Sál and Sain, &c., Karis, 12′ × 5″ × 4″ ...	{ 50 0 0 / 25 0 0	60 0 0 / 30 0 0	.. / ...	... / ...	
Sál bed posts, 7′ × 2½″ × 2½″ ...	9 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	25 0 0	75 0 0	

THE

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Forest Administration in the Central Provinces.

The writer of the article on the Central Provinces Forest Administration, which appeared in the *Forester* for August, has made out an apparently good case for the belief that is in him, that all our financial shortcomings are due to the substitution of localized and systematic fellings for the old unregulated and unscientific methods of former years. But although I agree with a good deal of what "C" writes on this subject, it is desirable that certain not unimportant inaccuracies should be pointed out in his figures, which tend to mislead, and that in some other matters his article should not be allowed to pass unchallenged.

As the question argued is principally one of diminishing receipts and is not immediately concerned with our unavoidable but increasing expenditure, I will, for the present, leave all figures relating to the latter out of the discussion. The statement of receipts given in "C's" article is as follows :—

1892-93	=	Rs.	14,48,508
1893-94	=	,,	10,92,618
1894-95	=	,,	10,43,306

According to which, the year 1893-94 exhibited a decrease of revenue equal to Rs. 3,55,890, and the year 1894-95 a further decrease of Rs. 49,312.

The actual state of affairs is bad enough, but our position is not quite so bad as above represented. "C" has been too superficial in his study of those interesting annual reports and has no doubt inadvertently made the mistake of quoting for 1892-93 the figures for the *15 months* that went to make up the above forest year, as will be remembered by all Forest officers, and has then compared them with the figures of the two subsequent years, which contained only the normal *12 months* each. The comparison is, of course, misleading and shows a much larger falling off in gross receipts than has actually occurred. If, instead of the abnormal forest year 1892-93, the figures of the financial year had been used for comparison, as they should have been, we should find the following results :—

Financial year 1892-93	=	Rs.	12,30,854
Forest year 1893-94	=	,,	10,92,618
Forest year 1891-95	=	,,	10,43,306

which shows a total falling off in receipts, during the two latter years, of Rs. 1,87 548, instead of Rs. 4,05,202, as exhibited in "C's" statement, or rather less than half this latter amount.

Having made this very necessary correction, I will now return to the chief subject of "C's" discourse. It was inevitable that such a radical change of system as has taken place in these Provinces should have an immediate and depressing effect on the revenue, and the reason for such results is not difficult to explain. Previous to 1893-94, almost all the Government forests were available for supplying the public requirements. A purchaser of timber having paid for his license could enter a forest and pick and choose here, there and everywhere, provided he restricted his operations to the special kinds of trees entered in his license. Time being of no great importance to him, he often wandered over extensive areas searching for his requirements and always taking care to select the best available trees in the most accessible situations. This procedure carried out over a considerable period necessarily caused the removal of the best material, and as the felling was almost invariably badly done, a high stump being left above ground, it resulted that our forests, especially in accessible localities, gradually became degraded in character until in many places they are now composed of growth, fit only for firewood. Under the present dispensation, however, all this has been altered. The forest reserves have been divided up into working circles, each of which again has been subdivided into 15, 20 or 30 compartments according to the years of the rotation fixed for the locality. But this latter is greatly dependant on the grazing question which is of primary importance in these provinces and varies correspondingly with the pressure on the forests for this requirement. Where, for instance, few cattle are dependant on the Government forest, it is practicable to reduce the rotation to the lowest possible limit required for providing a sufficient period of close protection for the areas that have been felled over; but on the other hand where cattle are very numerous, as in the majority of our forests, the rotation has to be extended to obtain the same desideratum. Most of our circles are divided into 30 compartments because it has been considered that at least 10 years of close protection are required for establishing the coppice re-growth and ensuring a certain amount of seedling reproduction, and because we cannot, owing to the grazing pressure, afford to close more than one-third of the forest area to cattle. The compartments are opened each year according to a fixed plan, therefore, only 1-30th of the area formerly open to a purchaser of timber is now available for his felling operations. Add to this fact that the compartment may be situated in forest that has suffered from the *selection system* above described and that the purchaser is no longer

allowed to fell his trees according to old methods, and it will easily be understood that in many cases he finds it difficult or impossible to obtain exactly what he wants, or becomes disgusted with the inferior quality of the material available and the extra trouble and expense entailed in exploiting it. It may perhaps be argued that, under the above circumstances, those parts of the forest should be first opened for working that have escaped the old drastic methods, and are still capable of supplying a fair quality of good material, but it may be answered that, such areas are often situated in relatively inaccessible situations and that if they had been selected for working, there would have been absolutely no demand on them, and the fall in revenue would have been even greater than it has been. We do endeavour to open the best areas first and to keep the worst part of the forest for the closing years of the rotation, but we have to temper our sylvicultural regulations with considerations connected with the general convenience of the people and not altogether unconnected with financial exigencies.

It is quite certain, in my opinion, therefore, that the change of system described above is responsible for a considerable fall of revenue, and it seems inevitable that this loss must be permanent for some considerable time ; in fact, until the accessible forests are improved, or until the more inaccessible forests are opened up by roads, which again, in this hilly country, will entail a large initial outlay. But while so far agreeing with "C's" remarks in this connection, I desire to point out that he has placed too much emphasis on this particular cause of loss, and has ignored at least an equally important one which I will now briefly touch on. Previous to 1891, no malguzar in these Provinces could fell timber from his estate without first obtaining permission from the Deputy Commissioner, and this permission was not accorded until the forest had been inspected by a Forest official and reported on as being able to supply the requisition. There was often some trouble and always much delay in obtaining the necessary permission, and complaints were not infrequent that the Forest official submitted incorrect reports to the effect that the forest in question was not able to yield, without injury, the quantity of timber asked for. The consequence of the restrictive rules was that comparatively few sales took place from malguzari areas.

But in October 1891, certain new rules were prescribed by the Local Government in Notification No. 7484, which practically conceded to malguzars the right to cut and sell their forest produce, provided certain fruit trees were respected and also provided certain specified sylvicultural requirements were complied with.

By this notification, all the private waste of the Provinces or about 12,000 square miles was at once thrown open to the public for trading purposes, and although such lands, as

a rule, bore forest of inferior character, it could not but happen that extensive areas were found capable of supplying the public demand, especially as their situation is frequently more accessible than that of the Government reserves. Couple with this liberal trading permission the fact that the period 1895-96 has been one of exceptional agricultural depression in most of the districts of the Central Provinces where many malguzars have found it difficult to meet the land revenue demands on their villages, and it can be understood that the newly acquired right must have been worked with a will and in some instances with more energy than was desirable for the future welfare of the forests. The new rules, if they could be enforced are sufficiently protective in their prescriptions to ensure the permanency of the private forest, but the due enforcement of the rules is rendered very difficult by the want of proper inspection and the temptation of the landlord to exploit his property in the quickest possible time. To effect this latter object, he will, if he can obtain the Deputy Commissioner's permission, farm his forest to a contractor, and under nearly all circumstances is ready to take what he can get for his building poles and fuel. And in many cases, as his land lies beyond the ken of any Forest official, nothing is done to check the wasteful and discriminate working that is surely if slowly destroying the forest and curtailing the supplies on which the future convenience of the village is largely dependant. It is true that the village officials and some revenue subordinates are also expected to report on the working of these rules and to bring to notice all irregularities especially in connection with the overworking of the forests, but such officials are wanting in technical knowledge, and would probably not notice anything worthy of report, until the damage was done and the forest ruined; moreover their relations with the malguzars and owners of forest are not calculated to encourage much useful reporting in this connection. It is quite certain that the private forests of these Provinces have been in recent years and are now being very freely worked under the concession granted in 1891, and it is easily conceivable that as many of such forests are more accessible than the Government reserves as they are free of all the necessary but inconvenient restrictions insisted on by the Forest Department and as they offer material at cheaper rates, a considerable amount of trade has been diverted towards them that formerly was supplied from our forest; and in my opinion, a larger portion of the total decrease in our revenue, under all heads except grazing, is due to this cause than to any other. It is impossible to put this loss into figures, but I should feel justified in asserting that it is accountable for not less than half the total amount.

If to the two above fruitful but incalculable causes of a diminishing revenue is added the fact, that nearly a lakh of rupees has been remitted by Government in pursuance of their generous

policy in connection with grazing dues, that a further loss of several thousand rupees has been suffered under fuel and bamboos by a similar reduction of rates, and that loss of revenue must have resulted from the late bad seasons and from the disforestment or transfer to the Revenue Department of extensive areas of reserved forest, it need not be matter for wonder that our accounts have recently exhibited such very unsatisfactory results. And further, if with all these causes for a diminishing revenue, we have simultaneously been obliged to increase our expenditure under surveys, working plans, buildings, roads, and fire protection, to the tune of 1½ lakhs of rupees annually, it becomes fairly clear why our once fat surplus is rapidly melting away to the vanishing point, and things are not what they were. Some of these back losses, however, will come back to Government either through the Forest or Land Revenue Department. Harvests cannot always be so meagre as they have been of late years and any improvement in this respect will probably result in increased timber sales. Private forests will year by year grow less able to supply the present trade demand on them, which will then be diverted again to the Government forests, while the loss of forest revenue that must surely result from the gradual settlement of the 3,000 square miles which have been cut away from the reserves for purposes of cultivation, will be more than recovered in the shape of land rents and the increased development of the country that such an access of the cultivated area must entail. And while there is every reason to think that some portion of the old revenue will be recovered, it is certain that the present large annual outlay on surveys and buildings will soon cease, when the forest surplus will benefit by over a lakh of rupees in consequence.

Before closing this long and, I fear, tedious letter, I should like to make a few remarks in regard to "C's" statement, that if receipts do not rapidly increase after the year 1897, it will prove that the working plans now being prepared are not suitable for supplying the wants of the people and the local market. It by no means follows that this would be a correct inference to draw from a stationary revenue, for as explained in my above remarks in connection with the effects of the new working system on receipts and on the new policy in regard to the working of private forests, it is inevitable that the results of these two factors must be permanent for some considerable time. In preparing plans, it is sometimes incumbent on us, owing to grazing requirements, to fix rotations that are longer than absolutely required for producing the class of wood in demand, and by lengthening the rotation we have necessarily to curtail the area that may be opened for working each year, which in some cases has a restricting effect on sales, especially of building wood. But were we to shorten the rotations, one of two things would become necessary, either we should be obliged to curtail the area open for

grazing, which would cause much inconvenience to the people, or we should have to shorten the period of close protection afforded by the plans to areas that have been felled over, which would be sylviculturally hazardous. We cannot always make plans that will meet all the requirements of the local markets; all we can do is to endeavour to provide such requirements to the best of our ability, and we anticipate that in several localities the introduction of systematic working will certainly cause an immediate and relatively permanent loss of revenue, owing to the capability of the annual compartments being much less than the previous demand on the forest.

J. McKee,
Conservator of Forests,
Southern Circle, C. P.

Working Plans in the Southern Circle of Bombay.

It appears desirable to correct some of the statements made by "Organisation" in the July number of the *Forester*. As regards the Pen, Panwel, and Nagothna ranges of Colaba, section 7 of the above article is incorrect. The forests are principally mixed forests, teak predominating in the more accessible places, and other species in the remoter parts. The average diameter to which the trees grow is 12" to 18" at breast height according to the locality. The height is seldom less than 25 ft. It averages perhaps 35 ft. for teak and 40 ft. for the chief other species. In many of the remote parts the height and diameter growth is far greater. The forests of Aghan, Koregaon, and those near the Manikgad Hill, in Nagothna, Pen, and Panwel may be cited as instances. In Aghan I have found stumps of teak trees, cut two or three feet above the ground, over 200 years old, and coppicing very vigorously. Throughout these three ranges teak trees of large diameter coppice as well as, if not better than, smaller ones. Owing to the want of sufficient shady trees in the dry season, the soil is very dry, and *cæteris paribus* the larger the trees, the better their chance of coppicing when felled. The forests have been worked in two ways—

(1) by fellings on the clean cutting system;
(2) by selection fellings.

The effect of the first system has been to nearly stop natural regeneration. That of the second has been to get rid of nearly all the best trees. Sometimes teak alone was cut first in the coupes, the other species being removed the next year, to the detriment of the teak coppice. The word mature, as used in section 8, applied to trees of 4" diameter, is almost as out of place as it would be in Kanara or Burma.

As far as I am aware, no data were collected for Nagothna, as mentioned in para 11, except by me. Certainly none were collected in either Pen or Panwel. In these three ranges I examined 550 teak logs, and the results were recorded in the Divisional Office Colaba. The best rotation, as far as quantity was concerned, worked out generally in the different compartments at from 50 to 75 years, speaking roughly; while the value of the older material was proportionally much greater than that of younger wood. The supply of large material was getting smaller and that of small rafters was increasing, owing to cuttings outside forest limits. In addition, the want of shade for natural regeneration, the loss of trees at each time of coppicing, and other considerations, all point to the advisability of a fairly long rotation. In places where the shade trees have not all disappeared there are still many young seedlings to be found, as at Belapur and elsewhere. Accordingly, the necessity of preserving such trees for shade, as well as teak trees for seed, was pointed out. Government, taking all things into consideration, refused to sanction a shorter rotation than 40 years, and further ordered that standards should be kept. To anyone acquainted with both Colaba and Thana forests, the benefits of keeping standards are apparent. Perhaps "Organisation" can let us know how many, and what kinds of standards are now being reserved in the Colaba coupes. As a rule, softwood trees which are elsewhere not larger than hardwoods, are in Colaba much greater in height, owing to the destruction of the best of the latter. To describe the Colaba forests as "rafter forests" is as incorrect as to describe the Kanara or other high-class forests, as such. The few very large trees found here and there show what will grow in Colaba, if allowed, while the diseased trees on the borders of cultivation, and the extensive grass hills where there is no forest left, are not a guide, but a serious warning.

(*To be continued.*)

C. HODGSON.

3rd September 1896.

II.—CORRESPONDENCE.

Lantana—the Forester's friend?

I see from the March issue of the *Forester* that the discussion of *Lantana* is still to the fore; so in case you may care to have a few notes on it, I send you the following:—

Of course I am simply dealing with *Lantana* from a Forester's point. In the Annual Forest Report for 1894-95 I wrote a short para. on *Lantana* which I see quoted by Mr. Bagshawe. From it you will see that I was solely referring to our deciduous forests. *Lantana* flourishes under most conditions in Coorg. We find it both in the hills and in the plains of Mysore, and to all appearances quite as dense in the one place as in the other. It can stand

a rainfall of over 200" without any apparent injury, and on the other hand 30" to 40" a year does not come amiss to it; so that I will divide it into (*a*) *Lantana* in Deciduous forests and (*b*) *Lantana* in Evergreen forests.

(*a*) *Lantana in Deciduous forests.*

To this the remarks, as noted before, in the Coorg Forest Report for 1894-95 apply. In these forests *Lantana* requires to be kept well in bounds, as every available blank soon gets filled up to the exclusion of all forest growth. There is no doubt, however, that rich soil is being formed under it, by the decay of leaves and branches; but on the other hand the danger from fire is being multiplied tenfold. It is surprising in what a short time *Lantana* takes possession of the ground. Outside forest limits I have been shown fairly large stretches of land which were excellent grazing lands for the village cattle. These areas at first had bushes of *Lantana* scattered over them, with grassy spaces between, these spaces have gradually been lessened year by year, until the whole stretch is a mass of *Lantana*, through which cattle cannot enter, and even if they did, little or no grass would be found growing for them to graze on. Fires in such areas are most fierce during the dry season, destroying all growth which had sprung up and overtopped the *Lantana* before it took entire hold of the land. One such area was specially brought to my notice during the year, owing to the destruction of sandal on it. The patch in question is over 60 acres and consisted of a magnificent area of sandal from about 5 to 20 years old, with some larger trees scattered about. The sandal, protected by the scattered bushes from being eaten by cattle, had forced ahead, and by the time the entire area had closed over, had topped the *Lantana*, so that at the close of last rains the entire area may have been called a good sandal plantation with an undergrowth of *Lantana*, no doubt enriching the soil under it. During the last hot weather, which was an exceedingly bad year for fires, a good portion of the area was gutted and everything burnt clean—even some of the larger trees. It is perfectly hopeless to put out a fire once it enters a *Lantana* stretch, the matted mass allows of no check lines being cut at the time, and the fire simply flies with a strong wind in the right direction. Notwithstanding the great danger from fire, and also the fact that when *Lantana* is left alone in a deciduous forest, it will not allow the light-loving seedlings of the more valuable kinds of trees to shoot ahead, killing them by the dense shade and the continual drip during the rains, I would by no means out with *Lantana* wholesale from our forests. Though not the "Forester's friend," if quietly let alone, it can be made to become so if kept in bounds and looked after. None can dispute that *Lantana* is an excellent soil maker and a capital nurse under certain conditions. We spend large sums in sowing and planting yearly; so that it is well worth consideration whether the serviceable conditions of *Lantana* should

not be taken advantage of, of course keeping it well in hand, and in bounds. No doubt from the readiness with which the fruit of *Lantana* is eaten by birds, and scattered far and wide, also from the ease with which it germinates, the keeping in bounds of *Lantana* in a deciduous forest will always be a most difficult task; however, it is well worth a trial in some of our forests, especially where fire-protection is well assured, and the soil poor.

I now come to (*b*) *Lantana in Evergreen forests.* Here no doubt *Lantana* is of immense use in re-foresting blank areas, especially those cut over for any special purpose and then abandoned. In Coorg when coffee was first started, the system was to clear-fell an area, burn it over in the dry weather and then plant it up. Bumper crops of coffee were obtained for four or five seasons and then the coffee plants gradually died out, the soil was washed away and the area eventually abandoned. In a very short time *Lantana* stepped in and densely covered the whole area. Now if *Lantana* had not covered it a coarse grass—an *Andropogon* not fit for fodder—and weeds would have. This would have been fiercely burnt over yearly and the result would be an eternal blank and no soil. On the other hand *Lantana* in a densely matted state taking sole possession of the blank, forms soil every year, and in these evergreen areas with a very high rainfall is not so liable to burn; in fact I was shown stretches of *Lantana* which people had tried to burn during the dry weather of this year, which was an abnormally dry one, without succeeding. In such areas the soil is first formed under the *Lantana*, then seeds of different kinds of evergreen trees germinate and force themselves slowly but steadily through, and as soon as the shade over it is sufficiently dense the *Lantana* is killed out, as it cannot stand the evergreen shade overhead. The blank areas where coffee has been abandoned in the midst of evergreen forests, consist of thousands of acres, and in all these areas forest regeneration is proceeding surely but steadily, thanks to the protection of the *Lantana*.

From the above remarks it will be seen that in evergreen forests, where blanks occur *Lantana* should be encouraged rather than uprooted. In such forest areas no doubt *Lantana* may be called the "Forester's friend" to the fullest extent.

A. E. L.

IV.—REVIEWS.

The Bombay Administration Report for 1894-95.

The Annual Report of the Forest Department in Bombay and Sind for the year 1894-1895 is now to hand, and has been read with great interest.

NORTHERN CIRCLE.—The Reserved Forest was increased by 52,475 acres, the Protected Forest diminished by 98,671 acres, a large part of the loss being due to rectification of figures only. Excellent topographical maps on the 8-inch scale are being made by the Forest Survey Branch. The Working Plans Branch commenced to study the forests of the Panch Mahals Division. Forest settlement and demarcation work is coming to an end, as there remain only the Mandvi taluka of Surat, and about 8,000 acres in Thana, all of which should be completed in another year. The Circle now comprises just over 2,310 square miles, with a gross revenue of Rs. 7,38,680 or Rs. 4,62,709 net. A working plan for the Bhiwandi Range of Thana was sanctioned by Government, another (or three) for the talukas of Wada, Bassein, and Mahim, is prepared and under consideration.

All the working plans in the Northern and Central Circles are, or are intended to be, the same, namely, blocks of some 2,000 acres or less, as natural features may dictate, worked as coppice under standards at a rotation of 40 years. The individual areas of the annual coupes necessarily vary widely, and in the great haste in which the plans were made the principle of proportional fertility was forcedly somewhat neglected, and a full study of the growing stock was quite impossible, but the great number of coupes rendered any great variations of revenue improbable. Under these circumstances, the Conservator has a right to congratulate himself and his officers on the confirmation of the Thana working, particularly the 40 years' rotation, by results recently obtained in the Kolaba forests of the Southern Circle. It by no means follows that these working plans can be regarded as satisfactory. On the contrary, whatever may be the present intention, they can only be regarded as provisional arrangements.

It will probably be found necessary to modify them in two directions. In the first place, although no rights exist, the Bombay forests are so burdened with privileges that anything like real protection must be almost impossible, and some scheme for the regulation and as far as possible gradual extinction of these privileges seems necessary. The second point on which modification appears advisable is the treatment. It is incredible that coppice with standards should be the one suitable treatment for the whole country between Ahmedabad, Bombay, Satara and Sholapur. There must be large areas on which there is practically no demand for the privileges conceded and which might suitably be set apart for the production of large timber.

The demarcation of all the coupes for one complete rotation was found to be beyond the strength of the Working Plans Branch, and this task has been taken over by the Forest Survey. There are no less than 11,400 coupes in Thana alone, and it seems rather a stretch of benevolence on the part of Government to undertake so much trouble and expense in order that no villager may have to go more than 2 miles to avail himself of his privileges.

The protective staff is said to be weak, but with the multitude of privileged persons allowed in the forests, protection would under any circumstances be a matter of the greatest difficulty. There were 389 prosecutions, of which 94 were acquittals, together with 1,080 cases undetected, as well as 25 cases, all convictions, under the Land Revenue Code. Of the undetected cases, 502 were fires, There were 565 cases of unauthorised appropriation, (to call the offences by their shortest name) which is not bad for a population that gets so much for nothing.

On the subject of fires the Conservator remarks as follows :— "This question of fire protection is a most grave one in Thana. The "coupe" system, as it is popularly called, under which the Thana Forests are being worked, is in most ways a complete success. The people are furnished with rab-material and a livelihood, and the revenue remains at a high figure ; moreover, the coppice shoots from stools felled promise a fair crop for the next revolution, but it cannot be overlooked that there is a great dearth—too often a total absence—of seedlings to replace the present stools when their reproductive power shall be exhausted. There can be no doubt that mainly, if not entirely, this is due to forest fires The reserves, especially the areas which have come under the axe during the past 10 years, were fire-traced as usual, but in most instances the only use these traces served was to prevent the fire spreading beyond the limits of the reserves. The fact is, fires only very exceptionally enter the forests from outside, they are almost always kindled inside. In East Thana out of 131 fires no less than 123 commenced inside the reserves. These figures are suggestive, but still more so is the fact that the whole of the Tansa catchment area was burnt from end to end by fires which invariably commenced within it, although there is no one living there. The system of reporting each fire by post-card to the Collector as initiated by Mr. Sinclair has been continued with the modification that the post-card is sent to the Assistant Collector of the sub-division instead of to the Collector. All the Assistant Collectors appealed to state that the system is a useful one, but I confess I cannot concur. In the first year possibly the village officers were startled at being asked about fires, but as soon as they realized that that was all, the system, I fear, 'degenerated into' routine, and has become absolutely harmful as giving an idea that something real is being done, whereas it is not so. The Forest Department have done their best, and I think I may confidently assert that an immense improvement has been effected ; but it would seem that we have reached the best possible which is achievable by us under present conditions, and I have no hesitation in saying it is very far short of what must be achieved if the present working-plans are to be anything more than a trap. The vitality of the present stools may last out two or even three revolutions, but unless seedlings are produced to replace them as they fail, the ultimate result must be denudation.

The present subordinate establishment is admittedly short-handed, and it is possible that an improvement may be obtained by supplementing it by a temporary fire protection establishment. It is proposed to try the experiment this year, but I cannot conscientiously state that I have any confidence in its success. Under existing orders the people under one excuse or another have the right to wander unchallenged where they will, and, under these conditions, prevention becomes an impossibility with any establishment that we should be justified in employing. I am aware that it has been urged that forests are too often fired on purpose as a protest against the curtailment of privileges in them, but I confess I cannot believe this. The larger proportion of fires, I think, are, no doubt, purposely started, but the object is either to destroy the cover for wild animals which springs up and continues for 4 or 5 years after a coupe has been made, or in connection with shikar. I am in hopes of inducing the Collector to withdraw all gun licenses within a certain area round every fire that occurs, and this may have some effect ; but I fear that unless Government enforce communal responsibility, no real improvement can be hoped for much beyond the point which we have reached. And even this communal responsibility must be one that really touches all the members of the village. Withdrawing the right of grazing, even if it could be enforced, does not touch the Thakur or Katkari who fires the forests to drive out a sounder of pig to his Naik who waits for them with his matchlock. "

These remarks reveal the important fact that the regeneration leaves much to be desired. The new crop promises to be about as good as the old one, which as a rule is bad indeed compared with what the soil would produce if allowed. But it ought to be a great deal better. The failure is due, the Conservator says, mainly to fires, and no doubt he is right, though the other privileges have also something to say to it. Practically the whole of the fires are lit on purpose, the purpose being the better enjoyment of some one of the numerous privileges, more especially to provide deadwood, to facilitate access, and for game. It is quite a mistake to suppose that the fires are either accidental or malicious. Accidental fires, including those caused by travelling with torches, are very probably under 10% and purely malicious ones under 1%. The fire-traces appear to keep the fires in, not out, since out of 131 fires no less than 123 arose inside. The Tansa catchment area, a series of contiguous blocks acquired at great cost and free from rights or inhabitants, is fired from end to end every year. The object is simply shikar. Gun licenses are issued with a liberal hand for the alleged purpose of protecting crops. Game in general may possibly be slightly thinned by the men who fire Tansa, but *per contra* denudation is surely getting the upper hand, the forest is disappearing, the soil going into the lake, the rock coming to the surface, and the climate doubtless becoming more

extreme. It is the same in Surat and the Panch Mahals. In the former Division, the whole of the Dangs, 800 square miles of undemarcated leased forest with shifting cultivation, was burnt over as usual. In the Mandvi taluka of Surat, the area was entirely overrun as usual, notwithstanding the efforts of the Divisional Officers and Assistant Collector. A solid block of twelve deserted villages is exposed to fires entering from Gaekwari forest, besides those of our own shikaris, and the heavy grass is getting the upper hand. In the Panch Mahals, two men were caught, and the magistrate fined them in the Draconic penalty of rupee one. It does not follow from the fact of the fires usually arising within the forest, that the system of fire-traces is quite useless, but it does follow that the result may not justify the cost, and more especially it follows that something should be done towards enforcing the principle of communal responsibility. The villagers enjoy great *privileges which are the prime cause of the mischief.* In firing the forest they have everything to gain and nothing to lose. Naturally, they are bound to go on with the fires. The key to the situation seems to lie in the curtailment of privileges, followed, if necessary, by punitive police. There are no doubt difficulties, but we think more might be done in this direction. The number of compounded cases was 451 for Rs. 2,091. The policy of composition is in disfavour with Government, which has ruled that the evidence to be required before composition can be demanded must be *sufficient to secure a conviction in Court.* This ruling is hardly in accordance with the Forest Act, which says "*reasonable suspicion,*" a very different thing.

The number of cattle impounded was 10,593. The grazing rules were not allowed to be fully enforced, and the number of cattle impounded in Thana bore no proportion to the number illicitly grazed in coupes.

Natural reproduction by seedlings was as usual practically nil, the fires regularly killing down the few seedlings that appear, and in conjunction with hoof and tooth so deteriorating the soil that very few seeds can germinate. *Where* conditions are favourable, and protection effective, seedlings appear in numbers. Coppice shoots were fairly satisfactory. Artificial reproduction is resorted to a little everywhere, especially in the coupes, but the conditions that are fatal to natural regeneration are still more so here.

The number of cattle of all kinds grazed was as follows: at full rates, 13,048 for Rs. 6,742: at privileged rates, 9,698 for Rs. 1,588: free, 303,869; the estimated value of the concession being Rs. 1,61,053.

The outturn of the Circle was, timber, 3,477,678 c. ft. plus 592,348 (miscellaneous pieces ?): fuel, 4,906,453 c. ft.; bamboos, perhaps two millions: minor produce, Rs. 9,050.

The Dangs and Mandvi forests were not fully worked

The amount of wood removed under privileges cannot be estimated. The Panch Mahals fellings were all outside forest limits.

CENTRAL CIRCLE.—This charge contains six Civil Districts, or seven Forest Divisions, totalling 4,035,412 acres of Reserved and 7,810 acres of Protected Forest. The revenue was Rs. 7.84,403: expenditure, Rs. 1,63,241: establishments, Rs. 3,75,174. The outturn was, timber, 2,162,303 c. ft., plus 12,758 rafters: fuel: 3,903,890 c. ft.: bamboos, perhaps a million and a half, (but here, as elsewhere, it is not clear whether this total includes or excludes the head-loads and cart-loads which are stated separately): minor produce Rs. 27,315. Forest settlements are practically completed, but the same absence of rights and the same disastrous privileges are noticeable, as in the Northern Circle. The subordinate service comprised 16 Rangers, 64 Foresters, and 1,475 guards, plus 91 office employés. The Working Plans Branch is on the same lines as in the Northern Circle, and it applied the standard working plan in the standard manner to 1,150 sq. miles of Reserved Forest, The great idea is, to get regularity of working enforced at once so as to stop the irregular exploitations which have done so much harm in times past. Consequently it is possible that a certain amount of conversions or transformations may be found necessary when there is time to go into the matter. What form the conversions may take will depend on local conditions.

Natural regeneration is stated to be satisfactory on the whole, but it is believed that this, as in the Northern Circle, is mostly all coppice. Though not so stated, it is most probable that seedlings are at least as scarce and fugitive as elsewhere.

The Reserved forest was increased during the year by 160 sq. miles, the Protected diminished by 24 acres. The Forest Survey Branch is engaged in the Central Circle also in preparing valuable maps on scales of 4″, 2″, and 16″. About 18 per cent. of the total forest area has been cut into blocks and brought under regular working. The average size of the coupe is about 60 acres, but West Khandesh, with unexplained coupes of 350 acres, brings the average up to 95 acres.

Nothing is said as to the effect of Government of India Circular No. 17—105 of 15th July 1891, regarding the classification of existing "Reserved Forest" into Forests proper, commons open to all, and commons sometimes closed. It is known that Bombay started off at score, dividing its forests impartially into the three clases, it being the wish of the Revenue officers that each village should possess a little block of each. It would be interesting to know how much land (if any) appears in the records as forest, being in reality common land managed by the Revenue Department or village officers.

The cases disposed of in court numbered 1,716. The convictions were 1,275, affecting 3,359 persons. In the 341 cases that failed, no less than 1,022 persons were concerned. Two cases of

firing the forest by the simple expedient of burning rubbish to windward were acquitted by the magistrate, on the ground that there was a high wind blowing at the time! The number of cases compounded was 1,458, in which Rs. 5,041 were exacted as compensation, which shows a considerable increase over the previous year. Altogether out of a total number of 13,523 detected forest offences no less than 10,349 were let off with a warning. No wonder the Collector of Khandesh thinks it is time to "show the people that the chances of their suffering for the infringement of the law are greater than they supposed."

Fires also show an increase, more than 5 per cent. of the protected area being burnt, against 3 per cent. the previous year, that is to say, 205,376 as against 121, 328 acres. One fire in the Satpuras swept over 15,000 acres. The privilege holders did not render assistance as they are bound to do, and the matter is under the consideration of the Collector. In forwarding the West Khandesh Forest report, the Collector says :

"As regards protection of forests from fire, it does not seem that things are improving. The whole subject is a very difficult and disheartening one. In the case of some jungle that is burnt from end to end regularly every year the experiment might be tried of setting fire to it in half a dozen places early in the season when the greater part of the grass is still too damp to burn and letting the fire spread as it chooses. If a sufficiently early date were chosen the fire might then run only along the ridges where the grass was short and dry ; the longer coarser grass in the intervening valleys might not catch fire ; if this were so, then the different valleys would thenceforth be separated from each other by these natural fire-traces, so that if later in the season one or more valleys did catch fire the chances of the fire spreading to the others would be reduced. I propose this only for some forests that consist of a series of valleys : and a forest that is morally certain to be burnt in the course of the year whether we set fire to it or not. If a forest is destined to take fire in any case, it seems better that it should take fire at that season when the fire can do least harm."

Mr. Hight, on returning to the Deccan after an absence of 15 years, bears valuable testimony to the fact that the period in question has produced a remarkable and visible change from the time when the euphorbia bush was the only growth on the hills, which was the state of things when he left.

The usual sowings and plantings were made, with the usual fairly satisfactory results. But until some proper settlement of the question of protection is arrived at, it would be unjust to attempt any criticism of this subject. Plants never live long in the Deccan without getting eaten down, and there is nothing to wonder at in the slowness with which the covering of the soil is being renewed.

Trespassing cattle show an increase of 43,149 head. The Conservator (and at least one Collector) remarks that the amount of

trespass is not greater than might be expected of the large area of forest and the habits of the people, and he shows that the people themselves commit far more "oppression" than the Forest Department, for *they impounded 507,638 head against the forest total of 337,918*. Of the latter 100,082 were sheep, and 73,882 goats, cattle proper being 163,945. The Collector of Nasik puts in a good word for the goat, on the ground that it can pick up a living easily and is valuable to the poor, so he would not exclude it *everywhere*.

The total number of cattle grazed was 1,369,344, of which 115,374 were buffaloes, 919,402 cattle, 325,594 goats and sheep, and 8,974 others.

Some 16,266 acres of reserved forest were, as usual, placed at the disposal of the Military Department for cutting grass, valued at Rs. 24,163, for which the Forest Department receives no credit.

The number of cattle allowed free grazing was 409,546, which includes only 644 sheep and goats. On the average these animals cannot eat less than a rupee's worth of grass or do less than a rupee's worth of damage, a-piece, during the year, say, four lakhs of rupees, which might find its way into the Forest budget. The value stated in the report being based on Government rates, is only Rs. 2,29,900, to which must be added Rs. 1,60,519, difference between privileged rates and full ones.

SOUTHERN CIRCLE.—About 505 sq. miles of Protected forest were converted into Reserved forest, together with 44 sq. miles of new lands. The area now stands at 5,318 sq. miles, of which 2,820 are Reserved and 2,498 Protected. Forest settlement is practically complete in Kolaba, Belgaum, and Dharwar, where barely 11 sq. miles remain to be settled, but in Kanara over 1,193 sq. miles require attention. Rs. 43,294 were spent on Forest settlement, exclusive of demarcation, in the year, which brings the total cost up to date up to Rs. 3,61,443, or at the rate of Rs. 110 per sq. mile. Demarcation appears to be hardly begun. Twenty villages of Kanara cost Rs. 505 for 99 miles of lines and 719 plates fixed. Here also the Forest Survey Branch is engaged on important maps on the scales of 4" and 8" to the mile, at a cost, roughly, of some Rs. 200 per square mile. As regards working plans, it may be well to let the Conservator speak for himself, and it may be added that the climate of most parts of Kanara, and of other Ghât districts would surely be considered respectable, even among the bluest-blooded microbes of the terai.

"The following table shows the work done by Party II :—

Year.	Jungle cut and cleared.	Linear miles surveyed.	Posts fixed.	Test trees felled.	Number of compartments formed.	Test area enumerated.	Area for which full *data* for the preparation of plans have been collected.	Total cost.	Cost per acre.		
	Miles.					Acres.	Acres.	Rs.	Rs.	A.	P.
1894-95 ..	36·591	31·708	794	29	27	1,188	15,812	20,539	1	4	9·4
1893-94 ..	68·976	71·792	828	126	36	1,550	21,106	22,979	1	1	5
Difference	—32·385	—40·084	—34	—97	—9	—362	—5,294	—2,440	+0	3	4·4

"Party II, under Mr. Bell, continued the organization of the teak-bearing areas drained by the Kalanadi, Kaneri and Nagzhari streams, the produce of which is transported by water to Karwar. The tract examined comprises an area of 15,812 acres, and is extremely unhealthy and mountainous, and, consequently, difficult to work in. The labour was increased by the fact that there were no maps of the forest, which had to be prepared by the Working-Plans party."

"Sickness was prevalent and none of the party escaped. The Extra-Assistant fell seriously ill, and had to take two months' leave during the working-season, and Mr. Bell, himself, was constantly down with fever."

"Under these circumstances, it is scarcely to be wondered at that the out-turn of work shows a falling-off. Fortunately, the work to be done in the so-called Gund group, which is in the most unhealthy part of Kanara, was completed on the 15th April, and the organization of the upper slopes of the Bedti river in the Central Division was commenced, and will be continued this season."

"The Governments of India and Bombay have both animadverted on the cost of the organization of teak-forests of Kanara, and appear to ascribe the comparatively high rate of expenditure to over-elaboration. It seems, therefore, incumbent on me to explain briefly how matters stand. I am most anxious to expedite matters and to make the organization as cheap and simple as possible, but I do not think that it can be further simplified; and Government will, I trust, make allowance for the great difficulties with which all work in Kanara is beset."

"The situation is as follows. The subject of the organization consists of a forest of trees of various species and ages from the seedling to the overmature tree three or four centuries old. The country is mountainous and very sparsely populated. The age-classes are not separated in space, trees of all ages being mixed up together."

"The forest has, in the first place, to be divided into manageable units, or compartments, of about 600 acres, by means of narrow lanes cut through it, where no natural features are available for the purpose. This breaking-up of the area into compartments is necessary for the organization itself, and for the carrying out of the so-called working-plan ; the rides, thus formed, are also useful for patrol-protection, and frequently for the exploitation of produce."

"About 7 per cent. of the trees are enumerated in diameter-classes, by means of long narrow test-plots ; and the number of trees of each diameter-class of a species is deduced for the whole area from the figures thus obtained. From this result the number of trees annually exploitable is determined with due regard to the number of trees in each diameter-class and the increment of the older classes."

"There is surely nothing elaborate in this mode of procedure, and the heavy average cost up to date may safely be ascribed partly to the peculiar conditions already referred to ; and partly to initial difficulties in the carrying out of any undertaking of the kind, which disappear as soon as the staff has got into good working order. I feel confident that the cost this year and in years to come will be less than that of previous years."

"The rest of the work—the location of the cuttings for the first period, the number of trees to be cut annually during the regulation of grazing and other privileges, of the annual works of regeneration and improvement, &c., is done during the rainy season from *data* collected during the field season, and no further expense is incurred by the party in the field."

"The following table shows the details of work done by Party No. I during the two last seasons :—

Year.	Area estimated.	Test trees felled.	Number of compartments formed.	Area for which *data* for the preparation of working-plans were collected.	Number of maps and tracings.	Total cost incurred.	Cost per acre.
						Rs.	Rs. A. P.
1894-95 ..	89,640·12	3,85 2	20	89,640·12	57	23,156	0 4 1·5
1893-94 ..	1,35,406·19	340	28	1,35,406·19	47	22,963	0 2 8
Difference	−45,766 07	+2,512	+8	−45,766·07	+10	+ 193	+0 2 5·5

"This party was employed throughout the year in Kolaba, and completed the organization of that district."

"The Divisional Officer, referring to the comparative slowness of the work last season, ascribes it to the greater difficulty of the

country and of obtaining daily labour, which had to be procured by the month, and lastly, to sickness of the members of the permanent establishment who all suffered from fever."

"The character of the forest examined was similar to that organised during the previous season, and for which a plan of working was submitted for the sanction of Government with my No. 5309, dated 13th December 1894. The work last season was carried out on the same lines, and the proposed plan of working the forests has been submitted by the Divisional Officer and will shortly be in the hands of Government."

"The cost of the preparation of plans for Kolaba has amounted to Rs. 46,119, and that for Kanara to Rs. 1,56,707 up to date."

"The total area for which complete *data* were collected, comprised 413,856 acres, and the average cost per acre came to 7 annas and 10 pies. Complete working-plans have been submitted for 364,257 acres of this area."

Forest protection is in the Southern Circle, with the exception of Colaba, less difficult than elsewhere, for reasons which are local and perhaps temporary. There were only 407 criminal court cases, of which 263 were in Colaba, a decrease of 90 which is generally attributed to the wish of Government to work the rules leniently. The Collector of Kanara thinks it would certainly be desirable to have more cases punished. The cases compounded were 416 for Rs. 1,571. Cases let off with a warning, and reported, were 363. As to fire protection, 67 sq. miles were reported as burnt, out of 1,432 fire-traced. This apparently does not represent anything like the area really burnt. In Belgaum alone there were 105 fires in the protected area, nearly all "undoubtedly caused by incendiaries intent on getting an early supply of grass for their cattle or of ashes for their fields." Altogether there were 649 cases of detected fires, the offenders being discovered in 12. The number of cattle impounded was 18,432, against 13,592 the previous year, which is stated to be few for so large an area, but it seems a small matter for congratulation in view of the leniency exercised.

Natural reproduction by coppice is said to be fair, except in a few cases where the soil or the stools have become exhausted. By seed, it was occasionally good, but too often ruined by cattle. In some well protected dense coppice fellings there was a pleasant appearance of seedlings of *Careya*, *Xylia*, *Terminalias*, etc. About 50,000 plants were put out with fair success. The Conservator's views on artificial regeneration are as follows:—

"The dibbling-in of seeds of the better kinds of tree, and the planting-out of seedlings under a certain amount of shade, appear to be the best and cheapest modes of artificially regenerating and improving the jardinaged forests of Kanara. Regular plantations there or in the poorest jungles of the Circle are rarely completely successful and always very expensive, and the attention of the Department is, therefore, directed to periodical closures in the first place, and, secondly, to the supplementing of natural growth by

the dibbling-in of seeds, and by the planting of superior species under cover of the advance-growth. In the more populous parts of the Circle, the difficulty of complete closure is one of the principal obstacles to be overcome, and, with a view to make it more effective, it is proposed, as already observed, to resort to barbed wire fences, and a quantity has been budgetted for in the estimates for 1896-97."

"Experiments made above and below the Ghâts show that planted seedlings of teak and other valuable species are quite able to establish themselves without aid if provided with a moderate amount of shade. Ample evidence of the truth of this assertion exists, for example, in the forests of Katgal below the Ghâts, and in those of Birchi above the Ghâts; but teak-seedlings planted out in regular plantations, in the open, require to be watered for one or two seasons, and even then do not seem to thrive. These considerations have led to regular plantations being looked upon with disfavour."

The outturn was, 1,405,520 c. ft. of timber, 7,768,107 c. ft. of fuel, 5,246,723 bamboos, 88 khandis (whatever that may be) of sandalwood, 322 c. ft. of sandalwood, plus 21,471 pieces of ditto, 31,887 khandis once more of myrabollams, and the usual variety of minor produce. The gross revenue was Rs. 1,525,028, the expenditure Rs. 8,16,892, (of which establishments cost Rs. 3,19,441) and the net revenue Rs. 7,08,136.

There is an interesting paragraph about *kumri*, which consists in firing the forest and raising crop in the ashes, here one year, there the next. As it throws some light on a previous remark to the effect that forest protection might not always be so easy, it is quoted as follows:—

"*Kumri Cultivation in Kanara.*—In the month of May, there was a serious, and apparently preconcerted, outbreak of *kumri* on the Súpá-ghâts in the Northern Division of Kanara. Some inhabitants of Anmód, the extreme north of the Mahal, began it by burning 20 acres of forest. The adjoining hamlets quickly followed suit, and in a very few days the evil became epidemic all along the ghats as far south as Anshi, distance of about 50 miles from Anmód as the crow flies. The efforts of the guards to prevent this illegal cultivation were vain in face of resistance and the odds opposed to them, and all they could do was to report each occurrence, as soon as discovered, to their superiors. On becoming aware of the seriousness of the outbreak, I despatched as many guards and foresters as could be obtained from Belgaum, and elsewhere, to the assistance of the local officers, and proceeded to the more northern part of the affected area. There I took down the depositions of forty groups of offenders, and Mr. Murray, the Divisional Officer then in charge, did the same for the southern portion. All concerned admitted the offence, and declared that they had committed it because, *kumri* having been closed to them in Goa, they no longer have any means of sub-

sistence. At the same time they declared their unwilingness to cultivate, on any terms whatsoever, the numerous fallow rice-lands existing in their village areas. In the end, this being the first offence of the kind, the offenders were leniently treated, and let off with small fines, the crops, if any, resulting from the cultivation, being ordered to be destroyed. The total area burnt is estimated to be 385 acres. The work was carried out so hurriedly that only small timber could be burnt, but most of the larger trees were cut down. The pecuniary loss to Government is, however, slight no very valuable species having been destroyed."

The Commissioner notes the fact that trespassing cattle, though very few compared to the Deccan, have increased by 35 per cent., and suggests that the bareness of the Deccan allows cattle to be easily seen, while the density of the forests in the Southern Circle renders discovery much more unlikely.

The total number of cattle grazed was, 103,160 at full rates, 452,179 at privileged rates, and 91,528 free, or 646,867 head in all. The amount received in fees was Rs. 1,06,280, and the value of grazing granted free or at privileged rates is estimated at Rs. 2,96,032.

Sind Circle.—The area at the end of the year was 1001 sq. miles and 266 acres, divided into four Divisions. As regards disforestments in Sukkur, the Conservator is "constrained to remark that the exclusion of 9432 acres in the Rohri taluka for the extension of cultivation was an ill-advised measure. The area in question was well wooded with an excellent growth of *Prosopis* and capable of yielding at the very least five lacs c. ft. per annum, besides being in close proximity to the N. W, R. line between Rohri and Sangi Stations. When it is remembered that it has been difficult to find some 50,000 acres conveniently situated to meet the requirements of the N. W. Ry. and that of the Quetta Commissariat, and for the purpose of opening a cheap and permanent supply to the latter, a scheme was under the consideration of Government to create near Sultan Kot a Sissoo forest on the lines of Changa Manga plantation in the Punjab, the disforestment of this block is not intelligible. In a case like this I consider the interests of Government in the Forest Department ought to have prevailed over those in the Revenue Department Moreover it is necessary to state here that the conversion of the disforested area referred to into a Sissoo forest would not have cost anything like the amount which is estimated for the Sultan Kot project, as it comes within the direct influence of the annual floods and is at the same time safe from erosion." The other disforestment in Sukkur was the Macaulay Belo, near Jacobabad, for which no reasons are given. In the Nausharo Division, 4,642 acres were given up, "mostly poor and badly stocked, and there were no possible means of improving it, owing to protective bunds erected of late years by the P. W. D. having cut off its water-supply by natural overflow."

"The principal feature of the year's administration is the gradual reduction in the working charges, due to a beginning having been made to effect direct sales from the forests, thus following the example of other Circles both in the Bombay Presidency and elsewhere in India."

"The time is drawing very near when the Forest Department in Sind will no longer be looked upon as a wood-supplying agency, pure and simple, for the North-Western Railway and other public bodies, and its officers from the head of the Department to the lowest subordinate will, under the method of working just introduced—that of selling the standing crops in the coupes set apart for exploitation in each year—be freed from duties which, to say the least of them, were out of the common and very often vexatious."

"The additions to the area of the Reserved Forests during the year under report amounted to 50,793 acres, while the exclusions, which took place only in the Sukkur and Nausharo Divisions, aggregated 37,945 acres, the net result being an increase of 12,851 acres. The Protected Forests, which are very few and far between, were not added to, but on the contrary a small forest, having an area of 183 acres, was disforested."

"The office of the Forest Settlement and Demarcation Officer for Sind was closed at the end of March 1895. During the tenure of office of Mr. Barrow, I. C. S., the Special Officer, 10,996 acres were notified under Sections 4 and 19, respectively, of the Indian Forest Act, and 38,330 acres were disforested under Section 26."

"The total cost of the settlement operations for the period extending from 27th October 1892 to 26th March 1895 was Rs. 7,581 exclusive of Mr. Barrow's pay and allowances."

"The work of demarcation was much behind-hand, and to carry it out the appointment of a special officer has been proposed."

"The survey of the riverain forests by a party of the Government of India has, it would appear, made considerable progress, and the maps of a greater portion of the areas that have been surveyed will soon be ready for issue."

"No change was made in the rough scheme of working the forests which came into operation during the year 1891-92."

"Very little progress was made towards cutting up the forests into compartments owing to want of measurers. Now that a qualified Surveyor is attached to each Division, it will be seen that this important work proceeds satisfactorily."

The erosion record is a bad one, 15156 acres of sandy flats left behind by the river, against 16,408 acres (of which, 10,000 mature forest) swept away. The Commissioner in Sind is "*convinced*" that the timber carried away by the river ought to be saved. He has seen miles of well-grown trees toppling into the water, and to save this loss he would have the forest officer, "immediately the inundation has subsided, mark out for immediate

'cutting, (independently of the rotation compartments) ribbon 'strips some hundreds of yards wide" the whole length of a 'cutting' bank, bearing trees. This would lead immediately to the abandonment of any definite working plan, and of any kind of attempt at order, not to mention numerous other inconveniences, not the least of which is the fact that the cutting bank of one year is not the least certain to continue being cut the next. Still, it might be worth while for Sind foresters to give the subject their most serious attention. Rs. 1,285 were indeed spent in such work. Something more, if not much, might perhaps be done in this direction. The reasons *contra* should at any rate be closely investigated. It appears that the promiscuous carrying of axes in the forests which was not allowed in the old days, is now here as elsewhere a practice. There is one excellent practice in Sind which has not yet been abolished, *viz.*, the maintenance of cairns and boundary lines by cattle-owners or herdsmen, in return for the privileges they enjoy. This saves the Department at least Rs. 10,000 a year.

Working plans are practically none, the supply of fuel to the N. W. R., and to the few large towns, comprising hitherto the *raison d'être* of the Department. Some sort of system of blocking out one-twelfth of each forest for railway or local supply was indeed introduced three years previously, but appears to have been unworkable. Many of the forests have been for many years cut up into half-mile squares by 20 ft. rides. Including the disforestments, 487,169 acres have been cut up by 2,892 miles of rides, many of which form useful public roads, according to the movements of the river, and the places where it has to be crossed.

The cases tried by Magistrates were 67. Those compounded were 1,340, being 1,165 of illicit grazing and 171 of theft. In two of the Divisions thefts show a considerable decrease, but in the two others the increase of 23 to 52, and 4 to 17 is put down to the leniency of the previous year, and the forests began to show signs of serious damage. The fires are reported as only 60 and the area burnt 3,544 acres, or little more than half the previous year's total The reason was a very high and early inundation. The fires as usual are caused by incendiaries, cattle breeders this time, for the most part, aided by deadwood seekers. In two forests, special precautions, preceded by punitive grazing fees, resulted in the absence of fires, for the first time in their history. The number of animals impounded was 22,988, which by no means represents the total that risked it, and were not discovered or escaped.

Natural reproduction was generally favourable, but the river left a deposit varying in some from 6 to 24 inches in depth. The Conservator, not without reason we think, seems deeply apprehensive of the results of th P. W. D. embankment policy.

Regarding pasture, it is noted that the *banking up of the river by protective bunds has completely destroyed the grass* in several forests, on which side of the bund is not clear. The number of animals grazed was 484,402, and the fees amounted to Rs. 48,581.

The number of privileged animals was 121,911, and the loss thereby was Rs. 5,076. Free grazing animals were 15,715, and the loss thereby Rs. 14,127, almost entirely given as rights under forest settlement, on what grounds it would be interesting to know. The total value of free or privileged grazing presented to a class at the public expense, thus amounts, for the whole Presidency, to Rs. 8,67,507 at Government rates, and is probably double it that sum in reality.

The outturn was hampered (fortunately in the absence of data as to possible yield) by labour difficulties. The figures given are not very easily grasped, being mostly in logs, pieces, maunds, etc., but if from No. 57 is comprehensive, the total amount was 17,057,131 c. ft. Imports of chír and deodar from the Punjab, and of poplar from the Khairpur State, are beginning to check the demand for local grown timber. Minor produce gave Rs. 12,021 for babul pods, Rs. 8,400 for lac, Rs. 1,908 for munj and sar grass, and Rs. 4,234 for fisheries. Cultivation in forest lands produced Rs. 18,127 for 5.482 acres. Temporary cultivation is in Sind a most useful and necessary assistance to forestry, salt lands being rendered capable of growing trees, and alluvial deposits kept under control till they become high enough for sowing or naturally clothed with seedlings instead of grass. In the mean time the cultivators render great services in many ways, and are a bond of good relations with the people.

The total receipts were Rs. 6,79,823, the expenditure Rs. 3,15,444, establishments Rs. 1,02,313, Surplus Rs. 2,40,293. The latter would have been increased by Rs. 20,000 odd, but that delivery could not be completed within the financial year.

VI.—EXTRACTS, NOTES & QUERIES.

White Ants.

By James Cleghorn, Esq.

In 1888, while in the Orissa district, I took some interest in trying to work out the complete natural history of the White Ant pest, for if this is not done, it is almost impossible to suggest practical remedies. It is a mistake to try remedies and nostrums which, from half knowledge of the subject or absence of knowledge, generally result in the remedy proving more harmful than the disease. I was disturbed in my researches, and having since been unable to pursue the thread of my enquiries, I fear the opportunity for completing them will not be mine. But as I gather that the White Ant pest is at present making itself felt in Assam and other districts, and at the Society's Gardens, I propose, with the permission of the Hon'ble President, to place before the meeting the following notes, which, though incomplete, may be of use if only by stimulating further enquiry.

The Queens.—Two are generally found in one cell, with one masked Queen as a reserve, but occasionally three fully developed Queens are met with in a cell, in addition to the reserve Queen. The natives always ignore the presence of the masked Queen, but when two fully developed Queens are found, they are styled King and Queen; when three are discovered they are called King, Queen and Prime Minister! The Queen's cell consists of a chamber with a flat floor and domed roof; the entrances to, and exits from it are only large enough to admit of the free passage of the ordinary White Ant, and the communication is always through the floor. The largest Queen I discovered amogst forty ant-hills of various sizes, was four inches long by half an inch in diameter. Some Mahomedans in Orissa use the Queens for medicinal purposes, swallowing them alive. When the Queens die naturally, another cell is built, adjoining the old one, and new Queens are enclosed. But when the Queens die out of season, the reserve is made to take the place of the defunct sovereigns. If one out of the two Queens dies, and the reserve Queen unmasks, she demolishes the remaining Queen before her transformation is complete. Knowing the pugnacious character of these Queens during the process of unmasking, it has puzzled me how two of them can be made to occupy one cell. This is an important detail, as are all details in investigations tending to the destruction of insect pests.

The Masked Queen.—This creature is the ordinary flying White Ant, so numerous at the beginning of the rains, but minus wings. It is said that the females shed their wings after a flight of a few feet only, whereas the males soar to unknown heights, and disappear from the locality. My observation shewed me that, when unmasking, the reserve Queen first changes from a brown to a cream-coloured grub, with a pair of formidable nippers, and, in a state of quivering excitement, perambulates the cell with nippers extended, ready for a death struggle with anything and everything in the apartment. In one case I discovered she had burst up one old Queen, and had inflicted eleven wounds on the aged monarch's companion. After having demolished everything in her cell, the new Queen quiets down and attendants return and clear up the remains of the defunct Queens, making everything snug for the complete development of the new ruler. The provision of cells with reserve Queens is evidently a provision against the contingency of unseasonable death among the old Queens. But this reserve Queen never has a new cell built for her, as is the case when new Queens are selected in season. If the Queens die out of season, without provision having been made for a reserve Queen, the ant-hill is abandoned, or the commuuity dies out, and the fungoid spores, which the ants cultivate for food, spread, until the growth covers the hill which is a sign that it has been abandoned.

Eggs.—The new Queen's development is fairly rapid, and even when only an inch long, and as thick as a slate pencil, she

commences laying eggs, which are oval in shape, and transparent, with a soft cover, slightly tinged with brown.

These eggs accumulate in a small heap, and are carried away to the nurseries which contain combs, stocked with fungoid spores. There they are deposited in indiscriminate heaps. The young, on hatching out, crawl away from the heaps, and distribute themselves among the combs, which are of various sizes, and fit loosely in compartments corresponding to their size and shape. The passages to these compartments are guarded by the soldier ants. The combs appear to be constructed of chewed wood, or some material suitable for propagating spherical fungoid spores which appear to constitue the food of young ants found in all stages of development in the same comb. If these combs with the spores are exposed to light, and kept shaded from excessive heat, very handsome fungoid growths will develop.

The Soldier Ant.—This is a formidable customer with a reddish, brown head, furnished with retroussé nippers, and a cream coloured body. His function is apparently to keep watch and ward over the nurseries, and cater for the rising generation.

The Overseer Ant—Is much like the soldier, but has a larger head, while its nippers turn inwards towards its face which are thin and flat, and provided with cutting edges terminating in a point. He seems to direct operations, and has been observed to pull down bad work, and strengthen weak places. He has always in attendance a gang of workers, has never been found in the nursery, but is allowed occasional admittance into the Queen's cell. He is very pugnacious, and has been seen to drive his nippers into the Queen's body; then the lady, by a muscular movement, summons her attendants, who muster in force and make him "move on."

Workers and Attendants.—These have small heads, with transparent abdomen, and aways appear to be full of food. They swarm over the Queen's body, intently examining every part with their nippers and feelers, and when one of them discovers anything unusual, that august body indulges in a muscular movement, then all the ants suddenly evince an absorbing interest in that particular spot. The object of this incessant examination is probably to prevent the Queen from being successfully attacked by parasites which infest the hills in great numbers.

Parasites.—Immense numbers of small flies are bred in White Ants' nests, and in the combs I have observed a spider which hides its identity by attaching to its body pieces of comb and spores. But my researches have, so far, not enabled me to suggest any parasite which might be utilized in exterminating the White Ant. In fact, I do not believe in the utility of employing parasites, as it seems to me a question in the economy of nature sustaining the necessary balance, and would probably lead to the development of the species they are intended to destroy.

To the question as to whether the White Ant in garden, field or forest is an enemy or friend, the writer would be inclined to include him in the latter category, *when kept in his proper place.* But as he is popularly considered a foe, a few hints on how to deal with him, and the grubs which, in many instances, are the destructive agents for which the White Ant is made the scapegoat, may not be out of place.

(1) As each ant-hill is dependent on its Queens, and as there is never more than *one* Queen's cell in each hill, that cell should be found, and the Queens, *together with the reserve Queen*, should be destroyed during the months from March to November, when there is no stock of new Queens available, and with a little practice, these cells can be located. For instance, in Orissa, we used to look for them just above ordinary flood level, and, on digging to a depth of about eight inches on the north-west face of the hill, we used to discover the cell. But the operations will never be successful unless the masked Queen, who appears to be very intelligent, and quick at concealing herself, is secured and also destroyed. If she escapes the search, she is made to continue the work, until the proper season comes round again for securing new Queens.

(2) I have kept woodwork in the river bed free from attacks of White Ants, by watering it with a 5 per cent. solution of *common salt* ; but fancy any deliquescent salt would be strong enough to answer the purpose, if applied in a 3 per cent. solution.

(3) The juice of the Aloe plant from which fibre is made, if applied *fresh*, will destroy ant-hills ; but if allowed to ferment is uselsss.

(4) When fungoid growths appear on the outside of ant-hills, it is a sign that the nest has been abandoned. Some use might be made of this observation.

(5) White Ants will never attack healthy growing plants, nor will they attack a piece of rope which is kept properly tightened. They will build passages over a tightened rope, through which they will carry away other material, and, in like manner, they will build passages up the stems of plants in order to reach decayed or decaying matter, and will probably remove the surface of the bark along these passages, which surface is practically dead.

(6) When a plant has been cut round just below ground level by a grub belonging to a species of beetle, it is then that White Ants are ready to carry away the result of the grub's work ; the latter having taken three or four weeks to destroy the plant, moves off, and the White Ants are the only destructive agents which appear on a cursory examination. Now, if on the first signs of a plant drooping, the ground is dug up to a depth of six inches around it, and a careful examination is made of the vicinity, a grub, an inch or so in length, will be discovered.

(7) In the cultivation of the mulberry bush I found this grub caused much damage, but it was successfully dealt with by

digging a small circular trench, 9 inches from the stem, in which was laid a train of sulphate of iron and lime. The trench should be about three inches deep and an inch wide, and there should be just sufficient of this mixture to make a train.

(8) In pruning the mulberry bushes according to methods laid down in books, I found that a small beetle promptly established itself in the pith of the branch exposed by the cut, and, working down to the stem, eventually killed the plant. But, just before the plant died, the beetle would make off, and the White Ant succeeding him was unjustly blamed for the damage. To obviate this, I had to resort to pruning flush with the ground, covering each operation over with ash or dried earth.

In a discussion that followed the reading of the paper, the Hon'ble Mr. P. Playfair fully endorsed the theory put forward by Mr. Cleghorn, that when White Ants are discovered attacking a growing plant, they should be regarded as evidence of previous damage committed by the cut worm, pith beetle, and similar pests, which by cutting the tap root and boring into the stem, kill the tree, thus preparing the way for further destruction by the White Ant.

The Secretary stated that the grub of the beetle had been found in leaf mould, dead branches, old trunks, at the base of dead trees and in old cow-dung, and made over to Mr. Cleghorn several grubs found at the bases of three *Araucarias* lately blown down. At the base of each *Araucaria* from ten to thirty of these grubs were found. They had bored into and through the stem, leaving a lot of dead wood on each side of the borings and demolishing the pith; White Ants had thus gained an entrance to the pith which they had destroyed, in one case to a height of 18 feet and in the others 13 feet and 7 feet respectively.

To obviate any error, these grubs have been carefully removed from the mould in which Mr. Cleghorn received them, and placed in some sterilized mould with fresh cut wood, so that when the *imago* is obtained, it will be identified and means for destruction worked out.—*Journal of the Agri-Horticultural Society of India.*

A few Notes on the Palmyrah Palm.

The Palmyrah palm (*Borassus flabelliformis*) grows exceedingly well in the dry low country of Ceylon, and especially in the Northern Province on the peninsula. The question of Government taking up the cultivation through the Forest Department has been under consideration for some time, on account of the large number of trees felled annually for export to India, and for the large local demand. This export has been so large that a fear was expressed that the supply might become exhausted,

and as the natives depend largely on their trees as a means of subsistence, this would have been a very serious matter.

In our opinion, this danger does not exist, but it would nevertheless be sound policy for Government to have a large reserve in Palmyrahs not only in case of such a thing happening but because there are large tracts of scrub land, which will not grow good forest, and which are eminently suited for the cultivation of Palmyrah palm ; as an example, we might mention the large tract of land adjoining the Mendakalaar in the Punakari Division.

The Palmyrah is unisexual, and the male tree is not nearly so valuable as the female, not only because it yields no fruit but because the wood is considered inferior. This palm comes into bearing at from 15 to 20 years and is considered fit for the axe at 80 years of age. It does not fruit all the year round, but gives one crop from August to October. The fruit contains 1, 2 or 3 seeds ; in general those with 3 seeds predominate and those with one seed are much rarer. The Tamils call the fruit with one nut "kudavan," those with two nuts "irakali," those with three nuts "mookali." And an average crop is 50 fruits per tree, worth about 25 cents, the male tree being worth about 3 cents per annum from leaves sold.

If, however, the tree can be used for drawing toddy, the value per annum is much increased, a female tree being worth from 62 to 75 cents and a male tree 18 to 25 cents each. Taking toddy from the tree is, however, very exhausting, and we cannot recommend it except where there are a much larger percentage of male trees than are required for fertilizing the flowers of the female trees.

The percentage of male to female trees in a field would therefore greatly affect the value to be expected per annum. Estimates roughly made quoted 40 female to 60 male, again 50 female to 50 male ; to test the accuracy of these estimates a large number of Palmyrahs were counted with the following result :— Out of a total of 488 Palmyrahs counted, we found 296 female as against 192 male giving in a hundred 60 female to 40 male trees, but as we also found in these clumps a large number of stumps, all of which were probably female trees, cut for timber, we are much inclined to anticipate that in a clearing the female trees would be as 2 to 1 of the males.

Nothing spoils the Palmyrah palms so much as being grazed by cattle, and it is most important that the clearings should be securely fenced, as if once cattle graze the palm in its youth, it takes years to recoup.

An extraordinary estimate for planting Palmyrah is given by Mr. Vincent and quoted by Messrs. Ferguson in their handbook for 1893.

"The cultivation is of the easiest in light sandy soil. Make a hole, put in the nut and fence from cattle for 3 years, costing altogether Rs. 3 per acre ; at the end of 10 years rents for

jaggery would pay well ; and at the end of 80 years, the value of timber should be Rs. 525 per acre ; total outlay in 10 years say Rs. 14 per acre."

We regret that the figures are not given in detail, especially the number of trees to be put in per acre. Our opinion is that the tree should be planted 6′ × 6′ giving 1,210 trees per acre if planted alone, though we should much like to see date-palms given a fair chance in Ceylon. However, we must confess that this estimate is quite beyond us. Our own opinion is that it will cost about Rs. 80 per acre. The low scrub would have to be cleared and burnt. A fence, capable of not only keeping out cattle, but elephants, will be required together with a deep drain all round. Close supervision is necessary or the natives will come and dig up the young plants to eat the roots, and wells will be necessary, for the plants will require watering.

Ceylon Forester.

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* Timbers in the Straits Settlements.

BY MR. HENRY J. CHILD.

The following remarks are based upon practical experience, and from frequent visits to the timber ponds and saw mills about Singapore, as well as information obtained from reliable sources during five years' residence at this station.

The timbers will be referred to in the order of their durability and use, those of equal value being classed together.

Belian, Tampenis, and Krangi.—These three timbers are really ironwoods, and are practically indestructible, as the white-ant will not touch them. They are scarce, as the Chinese cut and export all *Belian* and *Krangi* to China for coffins, but at present a supply of *Belian* can be obtained from Sarawak. *Belian* grows in swampy forests near rivers, and the tree is of large size. The timber is of a drab colour when first cut, but turns darker on exposure, and is close-grained and very difficult to work. *Tampenis* is of moderate size and a rich brown colour, close-grained, very heavy, and becomes extremely hard with age. It is now very scarce, as it is only found in young trees, and is generally used for tool handles and dowels. It was used for all buildings erected in Singapore 30 years ago, but the particular forest from which it was obtained has now disappeared, having been cut down for timber. *Krangi* is a large tree growing to a height of 60 ft. with a diameter of 4 ft., but

* Paper presented to the Association of Surveyors of H. M. Service. Supplement to Foreign Station Paper on Singapore.

is very uncommon in forests. The timber, which is of a dark colour and finely veined, is very hard and durable.

Ballow, Dammar Laut, and Rassak Merah.—These are all sound timber, resisting the white-ant if of good quality and well seasoned, and standing wet and exposure to sun and weather. *Ballow* is a large tree growing to a height from 60 ft. to 100 ft., and to a diameter of 6 ft., and has only a small amount of sapwood. Very sound and good timber is found in logs 12 in. to 15 in. square, the large logs often having large holes or hollows near the centre. The timber is of a light brown colour and darkens with exposure; it is hard and close-grained, easy to work, however, when fresh cut from the log, but more difficult afterwards, as the surface hardens on exposure, and after planing feels rough. It cannot be used in small scantlings on account of its liability to warp. The timber is becoming more scarce every year on account of its being cut down and not re-planted, and the tree being of slow growth. There are inferior timbers brought into the Singapore market and called *Ballow*, but generally they are *Sundy* or *Dammar Pooty* and are too light in colour and weight. They do not darken on exposure, and through the action of the sun the surface becomes full of small cracks. These inferior timbers can usually be told by the smooth surface left after the plane. The best *Ballow*, known as *Ballow Hetam*, is dark in colour, heavy, and after planing the surface becomes very dark, whilst the ordinary quality is lighter in appearance, of a light brown tinged with rose colour in patches. *Ballow Bunga*, which is similar to *Ballow* but lighter in weight and colour, has usually a figured grain of light and dark shades alternately. *Dammar Laut* is a large tree, close-grained and very strong. The timber, containing a large quantity of resin, is light brown in colour and feels sticky to the touch. It is used for local sailing vessels, but is not common at Singapore. *Rassak Merah* is a large tree, logs being obtained 50 ft. long, and up to 2 ft. square. This timber is likely to replace *Ballow* at Singapore, as large quantities are imported from the surrounding Dutch islands. There are a good many varieties of *Rassak*, varying in colour from light to dark reddish brown. It darkens in colour after being cut from the log or planed, and can be distinguished from *Ballow* by its peculiar shining surface. It feels smooth, and after exposure to rain and sun turns a dark red and can be used in small scantlings. There is a timber known as *Rassah Pooty* (*pooty* meaning white), but it is of no value, and should not be used in permanent buildings.

Darroo and Tembusoo.—These timbers, if of the best qualities, will resist white ants, but the market is full of young trees, of inferior timber and therefore risky to use. *Daroo* has a moderate-sized trunk compared to its height, with a fair amount of sapwood, and grows straight with a bushy top; the bark being similar to that of an elm-tree with the grooving or hollows more evenly divided. Good timber, which is found in logs about 12 in. square and up to 30 ft. in length, is of a light straw or

yellow colour, containing a large amount of moisture, with a resinous substance having a peculiar aromatic smell which is noticed at once when the timber is freshly cut or planed. It is close-grained and easy to work, with great strength and stiffness, but must be used under cover, as dampness causes it to decay, and exposure to the sun badly cracks it. It can be used in small scantlings, and will stand heat without warping. It has a peculiar silver grain, having the appearance of the wood being in small squares. The smaller logs, 6 in. square and under, are from young trees, and are of inferior qualities. *Tembusoo* is a fine-looking tree growing in pyramidal form, and having dark bark with deep vertical grooves. It is often called *Ballow Pooty* by the natives. It is only to be obtained in small scantlings, as usually the tree branches 10 ft. from the ground, or if in large scantlings only in short lengths, and is used in joiners' work. There are a number of *Tembusoo* trees growing about the officers' quarters in the enclosure of the Tanglin Barracks at Singapore.

Miraboo, Kumpas, Ballowboo, and Giam are all of a dark reddish colour, with fancy grain or markings. They are used chiefly for furniture and fittings; but are not plentiful, and should not be used in the structure of buildings on account of liability to white-ants and decay.

Seriah, Meranti, and Kledang are eaten by white-ants and other insects, are liable to decay from wet, and will not stand exposure to the sun. They are used in the form of planks for boarding and floors, also for fittings to door and window openings. *Seriah* is a tall tree, with a smooth bark of light red colour. There are a number of varieties, varying in colour from reddish grey to red and light brown. One called *Seriah-batu* has occasional white grain in the annual rings, and is the best timber of its kind. *Meranti*, which is similar to *Seriah*, but of a more reddish brown, is a magnificent tree, running up straight to a height of about 80 ft. before branching, and will grow to 100 ft. or 150 ft. in height, with a diameter of 3 ft. to 5 ft. *Kledang* is of a yellowish brown colour, darkening on exposure; it usually has a grain of dark and light bands, and leaves the plane with a smooth surface, which looks very fine when French-polished.

Lampong, Bintangore, and Mangrove are readily eaten by white-ants and other insects. *Lampong* is soft and light in colour and weight, of no value, and used by the Malays for floats and boats. *Bintangore*, which is of a coarse grain and light red colour, is used only as round poles for shipping spars, rafters, and purlins to roofs of ordinary houses, and also for the framing of all temporary buildings and sheds. The market sizes are from 1 in. to 10 in. diameter, the darker in colour the better and harder the timber. Mangrove, which grows on mud banks covered by salt water, and can be had up to 30 ft. in length, and 6 in. to 10 in. in diameter, is always used for piling to foundations, and for firewood in Singapore. The timber is dark red in colour.

Garling is rarely met with, and is used by the Chinese for their planes and other tools. It is of a green colour with dark bands and is very hard and lasting.

Teak from Siam is used in Singapore for the better qualities of furniture, as it is light in weight and resists white-ants and other insects which destroy timber in the tropics. It also has a fancy pattern grain.

General Remarks.—The vernacular names have been given to these timbers, as a good many of the trees have no scientific ones. The scientific names can only be decided by the flowers, and many of these tropical trees only flower at intervals not at present known, and at a certain age. There is also a great difficulty in obtaining from the native hewers the flowers of the trees which they cut down. It is also not known for certain how to tell the age of the age of the hardwood trees, as until recently no records or observations were made. Three or four of the so-called annual rings might be added each year, while in some years no increase would take place. Observations have been made during the last eight or 10 years, but a period of at least 30 years must take place before any judgment can be formed as to the ages of these trees. It is probable that some of the huge hardwood trunks are at least 1000 years old. Generally speaking, the weight and darkness in colour of any tropical timber is a fair sign of its good quality. A good timber is always heavy, and where there are varieties of the same timber, the heaviest is the best. A number of the large-sized logs, about 24 in. square and upwards, are badly shaken at the centre, or have holes and vacancies with no decay. This has been caused either by discharge of lightning, or by these tall trees continually waving about with the wind. On the larger hardwood trees very little sapwood is found, and in many cases none at all.

In professional note-books references are found to "Johore teak." This is intended for *Ballow*, not teak, which comes from Siam, and is different both in appearance and weight.

The oak grows in Singapore, but the timber is of no value, being all open-grained, with the trunk running up straight, and nothing like the English oak tree in form.

There are other hardwood trees of the Malay Peninsula, one especially being so hard as to turn the edge of any axe, while others have poisonous sap which makes it dangerous work hewing them. As a matter of fact, the natives refuse even to climb any such trees.

At Singapore on the W. D. property, the following timbers may be found: At Tanglin, *Tampenis* in the structure of the officers' bungalows; at the new barracks on Blakan Mati and Pu lo Brani Islands, *Ballow Hetam* in the door and window frames; *Giam* in the majority of the cupboards and other fittings; *Garling* in the barrel stand in the canteen at Pulo Brani; *Red Russak* in the joists, beams and roofing laths; *Red Russak* or *Ballow* in the

frames of the wood partitions ; *Meranti* in the flooring and boarding of partitions ; and good *Syriah* in doors, window shutters balusters, and handrails.

Timbers in General Use, Singapore, Straits Settlements.

Native Name.	Scientific Name.	Local Cost in Log per Ton of 50 f. c.	Weight per Cube Foot in Pounds.	Value of Constant "a."	Value of Constant "c."	Value of "g."
		dols.				
Seriah ..	Shorea sp ..	5	39	.0102	470	282
Meranti ..	Hopea Meranti ..	5	40	.0102	470	282
,, Merah ..	Shorea sp furfuracea ..	7	45	.0102	470	282
Poonah ..	.. .. ..	5	43			
Samarang ..	.. .. ..	12	35½			
Rassak Pooty ..	.. .. ..	12½	56½			
,, Merah ..	Vatica Russak ..	18½	62	.0071	900	540
Bellian ..	Sideroxylon Zwageri ..	50	57	.0066	817	490
Renas ..	Gluta Rengas ..	12½	45½			
Teak ..	Tectona grandis ..	60	47	.0076	821	717
Ballow Hetam ..	.. .. ..	20	65	.0057	905	543
Ballow ..	.. .. ..	18½	60	.0057	905	543
,, Bunga ..	.. .. ..	17	60	.0071	864	518
Tembusoo ..	Fagræa peregrina ..	17	50			
Dammar Laut ..	Canarium Species ..	8½	63	.0068	1138	677
Darroo ..	Sideroxylon Malaccense ..	12½	57	.0054	1163	679
Krangi ..	Dialum Indicum ..	20	60	.0060	1012	607
Kledang ..	Artocarpur Species ..	10	46	.0076	895	537
Miraboo ..	Afzelia Palembanica ..	17	54	.0077	1016	610
Tampenis ..	Sloetia sideroxylon ..	20	62	.0071	1282	770
Kledang Pooty .	.. .. ..	17	45			
Garling ..	.. .. ..	25	50			
Bintangore ..	Calophyllum inophyllum	Sold by number of pieces	36	.0082	609	366
Mangrove ..	Rhizophora Species		64	.0070	900	540
Backow ..	.. ..		49			
Giam ..	.. ..	20	67			
Lampong ..	Hedycarpas cauliflora ..	4	28	.0147	384	230
Ballowboo ..	.. .. ..	20	56			

NOTES.

One dollar value 2s. 2d.

Constant "a" used in formula (Tredgold) $W = \frac{B\,D^2}{a\,\frac{2}{3}L}$ showing the greatest weight in pounds that can be put upon a beam, loaded in centre and supported at ends, without causing a deflection exceeding $\frac{1}{480}$th part of its length.

Constant "c" used in formula (Tredgold) $W = \frac{B\,D^2\,c}{L}$ showing the breaking weight in pounds for beam as above.

Value of S. is the value in pounds of S. used in formula (Barlow and Tarn) $S = \frac{8}{9}\ W_B \frac{L}{D^2}$ the transverse strength of timber 1 inch square 1 feet long for beam as above.

W = pounds weight ; B = breadth in inches ; D = depth in inches ; and L = length in feet.

Samples of the majority of these timbers are in the district surveyor's office, Singapore.

Scales of Timber Royalty charged by the Colony for Cutting Down Trees in the Forests at Malacca, Straits Settlements.

A.—*First Class.*

Name of Tree.	1 Ft. in Diameter.	1½ Ft. in Diameter.	2 Ft in Diameter.	2½ Ft. in Diameter.	3 Ft. in Diameter.	Remarks.
	dol.	dol.	dol.	dol.	dol.	
Ballow ..	2	4	6	8	10	These figures represent the value of the timber Duty at 25 per cent. (except where it is otherwise provided by the instructions) will be charged on these values. No timber of this class may be cut under 12 inch in diameter.
Belian ..	3	6	9	12	15	
Chengal ..	2	4	6	8	10	
Dammer Laut ..	2	4	6	8	10	
Fasal Linga ..	2	4	6	8	10	
Giam ..	2	4	6	8	10	
Kayu Arang ..	3	6	9	12	15	
Kulim ..	2	4	6	8	10	
Kshuk Baring ..	2	4	6	8	10	
Meraboo ..	2	4	6	8	10	
Penaga ..	2	4	6	8	10	
Tembusoo ..	2	4	6	8	10	
Tampenis	3	6	9	12	15	
Sepan	2	4	6	8	10	
Seriah Batu ..	2	4	6	8	10	

* Ebony should not be cut except by the Forest Department officers.

B.—*Class* 2.

Name of tree.	1 Ft. in Diameter.	1½ Ft. in Diameter.	2 Ft. in Diameter.	2½ Ft. in Diameter.	3 Ft. in Diameter.	2 In. in Diameter.	3 In. in Diameter.	4 In. in Diameter.	5 In. in Diameter.	6 In. in Diameter.	7 In. in Diameter.	8 In. in Diameter.	10 In. in Diameter.	Remarks.
	dol.	dol.	dol.	dol.	dol.	c.	c.	c.	c.	c.	c.	c.	c.	
Babi Kurus ..	1	2	3	4	5	1	2	4	7	10	15	20	25	Duty will be charged upon these values.
Berombong ..	1	2	3	4	5									
Bintangore ..	1	2	3	4	5									
Daroo ..	1	2	3	4	5									
Kelat ..	1	2	3	4	5									
Kladang ..	1	2	3	4	5									
Koranji ..	1	2	3	4	5									
Medang ..	1	2	3	4	5									
Merantí ..	1	2	3	4	5									
Pagar Anak ..	1	2	3	4	5									
Petaling ..	1	2	3	4	5									
Remas ..	1	2	3	4	5									
Rassak ..	1½	2	4	6	8									
Seriah Sabut ..	1	2	3	4	5									
Tampi-Tampi	1	2	3	4	5									

Class C.

	c.	dol.	dol.	dol.	dol.	c.	c.	c.	c.	c.	c.	c.	c.
All other woods ..	75	1	1 50	2	3	½	1	2	4	5	7	10	15

Pitch Pine.

People often ask, says the *Révue des Eaux et Fôrets*, what the Pitch pine is, and the question has just been answered by M. Pierre Boissaye, Garde Général, who is on a forest tour round the world and writes from Quebec, and tell us that the real pitch pine wood comes from the *Pinus australis*, which is a tall handsome tree found in the Southern United States. It is remarkable for its very cylindrical tall bole, so that it is capable of giving long pieces, especially masts and spars. The cones are very large and the seeds are edible. The Americans sometimes call the tree 'Broom pine' from its broomlike fascicles of pendant needles; but commercially the timber is known as 'pitch pine,' 'red pine' or 'yellow pine,' according as it consists of old resinous wood, ordinary middle aged wood without sapwood, or sapwood only. As a matter of fact, however, much of the timber sold under these names belongs to other species which are passed off as *Pinus australis*.

It has not been possible to introduce it successfully into France, as it is a tree of a much hotter climate, and the Révue does not recommend further attempts to grow it, as it considers that old Pinaster in the Landes if allowed to grow to the same exploitable age as pitch pine, that is 120 to 150 years, would give just as good products.

In India, an attempt was made some years ago to grow the *Pinus australis*, and we remember taking great pains, but unsuccessfully, to grow it in Dehra Dun. It might do better in a more equable climate, as about Bombay

We hope that, in the course of his travels, M Boissaye will visit India. He may be assured like many of our French comrades of a hearty reception.

Tour of the Coopers Hill students in France.

We read in the *Révue des Eaux et Fôrets* that this year the Coopers Hill Forest students have, for the sixth time, visited the beautiful oak forests of Réno-Valdieu, Bellême and Perche near Mortagne. There were six students under the Assistant Professor of Sylviculture, Mr. W. R. Fisher, but they were also accompanied by Mr. H. C. Hill, lately Acting Inspector-General of Forests in India, and Mr. Baylis, the Forest officer in charge of the Forest of Dean in Herefordshire, with three of his Rangers. They were also accompanied by the Conservator of Rouen and the Inspector of Louviers, and the whole party was guided by the Conservator of the Circle, M. Charlemagne and the Inspector, M. LeLecreur.

At this time, when Franch newspapers are full of untrue statements about and spiteful attacks upon England and English diplomacy, it is pleasant to find that the French Forest officers have been able to keep themselves above the petty meannesses of Parisian journalism and maintain the old friendship, which has so long existed between the Forest officers of France and of India, and which we sincerely hope will never be allowed to fail.

A Forest Department Blazer.

The following is an abstract of the replies which have been received in answer to a post-card circular on the subject of a Forest Department blazer, sent by Mr. Elliott to all officers of the Imperial Forest Service under the Government of India, except those in Burma.

	No. of replies.
Fully approve of proposed colours ...	19
Approve, but suggest modifications ...	17
Wish for colours, but disapprove of those proposed ...	4
Are indifferent on the subject ...	5
Disapprove of colours ...	3
Total ...	49

From some 40 officers no replies have as yet been received.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd September, 1896.

EAST INDIA TEAK—The deliveries for the first eight months of this year amount to 13,783 loads, compared with 11,831 loads for the same period of 1895. In August this year they have been 1,713 loads against the 2,185 loads delivered in August last year. The London stock continues very moderate, and the miscellaneous demand has been so good that prices have improved a little here. The floating supply continues to be firmly held for full rates.

ROSEWOOD, EAST INDIA—finds buyers at steady prices.

SATINWOOD, EAST INDIA—is in fair demand at steady prices.

EBONY, EAST INDIA—finds buyers at very fair prices.

PRICE CURRENT.

Indian teak	per load	£11	to	£16.
Rosewood	„ ton	£6	to	£10
Satinwood	„ foot sup.	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, September, 1896.

Cardamoms	per lb.	1s. 1d.	to	2s. 8d.
Croton seeds	per cwt.	66s.		
Cutch	„	17s.	to	32s. 6d.
Gum Arabic, Madras	„	50s.	to	75s.
Gum Kino	„	£20	to	£25.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 3½d.
„ Burma	„	1s. 4d.	to	1s. 11½d
Myrabolams, Bombay	per cwt.	3s. 9d.	to	7s.
„ Jubbulpore	„	3s. 9d.	to	6s.
„ Godavari	„	2s. 6d.	to	4s. 6d.
Nux Vomica, good	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Sapanwood, Madras	„	£4	to	£5, Nom.
Seed lac	„	70s.	to	95s.
Tamarind, Madras	„	6s.	to	7s.

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, Bareilly, and Delhi, for the month of August 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10 Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sál and Sain, &c., Karis 12″ × 5″ × 4″ { Sal ...	50 0 0	60 0 0			
{ Sain	30 0 0	40 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sál, 10′ Tors (Poles) ...	30 0 0	60 0 0	...	...	
Sál and Sain, &c., Karis 12′′ × 5′ × 4″ ...	25 0 0	35 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″ ..	4 0 0	5 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	33 0 0	{ 80 0 0 { 400 0 0	
BAREILLY.					
Sál, 10′ Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sál and Sain, &c., Karis, 12′ × 5″ × 4″	{ 25 0 0 { 40 0 0	{ 35 0 0 { 50 0 0 { 60 0 0	...	..	
Sál bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0			
Bamboos of 9′ to 10′ per 100 score ...	..	...	50 0 0	137 0 0	
DELHI.					
Sál, 10′ Tors (Poles) ...	5 0 0	{ 7 0 0 { 10 0 0	..	...	
Sál and Sain, &c., ...	{ 30 0 0	60 0 0	...	...	
Karis, 12′ × 5″ × 4″ ...	{ 20 0 0	25 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″ ...	8 0 0	9 0 0			
Bamboos of 9′ to 10′ per 100 score ...	...	...	20 0 0	75 0 0	

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A Few Days Holiday.

What is more delightful than a few days holiday after being stuffed up in an office for many weeks ; the pleasure of anticipation, wondering what one had better do to make the most of it ; the arrangements to be made and plans for getting to the best place in the shortest possible time ; the loading of the cartridges and cleaning of the gun long hidden away in the corner ; or the examination of the tackle box and fly-book, and the doubt whether it would not be wise to shy all the old tackle away and buy some more, sad memories of that monster fish, the largest one you had ever hooked, that disappeared with your best spoon and the greater part of an old and rotten trace, pointing strongly to the advisability of the latter proceeding.

Some time since it was my good fortune to obtain such a holiday, and I arranged with a hospitable brother-officer to spend it with him in the pursuit of such game as the native shikari had not succeeded in exterminating (which it may be noted was found to be but little) and in roaming about some of his picturesque and interesting deodar, oak, and pine forests, where points of interest to the Forester's eye strike one at every corner. These forests are the property of Independent Native States, and wherever conditions have rendered the material saleable, they have in most cases been most unmercifully "slated," all marketable timber having been cut out without any thought of what might happen in the future. I had ample opportunity of observing the effects of this short-sighted policy during my ride of 35 miles to join my friend's camp ; and the bare hillsides with but scattered and deformed specimens of deodar, oak, or pine, remaining of the fine forests which the vicinity of a large hill station and the high prices there obtaining have caused to disappear, show how complete the destruction has been. Of late years, a professional Forest officer has been deputed by Government to inspect the forests of the Native States, to advise the Chiefs as to the management of their

forests, and to bring to notice cases where they are wantonly destroying them either by lopping, overgrazing or overfelling. Much good has already resulted from this step. First, the States have been induced to demarcate all their more valuable forests, and then, by setting them aside as permanent timber-producing estates, rescue them from the gradual encroachment of cultivation, particularly that for the potato which in these hills is pursued sometimes but for a year or two to the great destruction of forest growth. Boundary registers and a rough record of rights are kept up for the demarcated areas. Then gradually simple Working Plans are being drawn up and the Chiefs induced to abide by their conditions, the principal of which is not to fell more than a fixed number of trees per annum. The lopping of deodar and to some extent of the blue pine has been put a stop to, within demarcated forests. The prevention of lopping in these forests is an extremely difficult problem. The people have been accustomed for ages to lop unchecked, and this destructive custom has become almost a necessity to them. The grass crop in these hills is but scanty, and the leaves of the oak (*Quercus dilatata*) are in great request as fodder. Deodar also and the pines (*Pinus longifolia* and *Pinus excelsa*) are in all unprotected areas heavily lopped up to a few feet of the top, but a branch being left at the crown. The branches and spines are used first as bedding for cattle, and afterwards, when well saturated with cattle refuse, as manure, being laid over the ploughed fields and worked well into the soil. I noticed two very interesting results from this heavy lopping; first, the destructive effects of parasites in general and more particularly of a species of *Loranthus* (probably *L. vestitus*) on the oak in heavily lopped areas. In one forest over a large area where lopping has been constant, nearly every tree had been thus attacked. Many of the trees have been already killed outright by the parasite which appears to suck the life out of the trees, mainly through the wounds caused by lopping, and to fairly smother it. An examination of the trees showed that wherever a branch had been lopped off, the *Loranthus* had obtained a fresh holding place on the tree over which it gradually spreads, until there is more *Loranthus* than oak. It can be but a question of a few years more or less and the oaks in this forest will be exterminated.

The second point which caught my attention was the effect on the crop of the lopping of certain species, whilst others were protected. The crop in the forest which came under my observation consists mainly of oak *(Q. dilatata)* and blue pine *(P. excelsa)* with a small mixture of deodar forming perhaps not more than 5 per cent. of the crop. Some 10 years ago the Chief of the State, of which this forest is the property, was induced to put a stop to the lopping of deodar, the lopping of the oak and blue pine continuing as before. The result of this has been that a very nearly pure young deodar forest is rapidly gaining possession of the ground, and in process of time there can be no doubt that, should present

conditions continue, this area will hold a nearly pure deodar forest. And judging from the results here obtained, it may be concluded that such loppings, in Forests in which it is desired to increase the proportion of deodar, might have the desired effect as successfully and rapidly as by ringing trees and undertaking expensive planting operations.

The country we were in is naturally the home of the kalege pheasant, and where cultivation affords them the necessary food, the chikore are to be heard chuckling in the early morning. Moreover, in certain favoured localities coveys of "*chir*," perhaps the best of the Himalayan pheasants from a sporting point of view, not to mention his great qualifications when placed, well cooked, upon the table, are to be found. In the higher portions of the oak forests a solitary "koklas" may yet be heard uttering his mournful cry or rather croak, giving one the impression that he must have a really bad sore throat. But pheasants in the neighbouring hill station are worth Re. 1 apiece, and chikore come in handy for a dinner party ; and one must go far a-field to find birds in any number. So our modest bag of 5 chir pheasants, and 3 chikore represented a lot of hard walking, not to say straight shooting, and the bottle of beer apiece at the close of the day was well earned. And so back to work again with a keener zest, and a pleasant sense of a much enjoyed holiday amongst the steep hills and the scattered forests of the Simla Hill States.

F. B. B.

Working Plans in the Southern Circle of Bombay.

(*Concluded.*)

THE NORTH KANARA WORKING PLAN.

The plan originally submitted for working the best forests of the Haliyal and Supa Taluka and Petta of the Kanara Collectorate was briefly as follows : —

The total area of the forests was divided into 24 equally productive parts as regards teak. Each of these parts was to be worked in turn once in 24 years on the selection system. Trees of 25 inches diameter and upwards only were to be felled, the rotation being fixed at 180 years.

The number of trees to be felled annually was calculated and this was divided into two parts as under :—

(1) The annual increment of the whole area.

(2) Half the extra increment accruing on the area which remained unexploited from the first year after the completion of the estimates till the year of exploitation.

The estimates were finished for the whole area in a few years, and so, in order to produce a series of age gradations for the second period, it was necessary to cut in the first year of the first period

and on the first area, 24 years' increment, or in other words the annual increment of the whole area = I. In the second year $I+\frac{I}{24}$ would have to be cut, as the second area would have produced one year's extra increment. In the third year $I+\frac{2}{24}I$ would be cut, and so on, until, in the twenty-fourth year, nearly 2I would be cut. In the twenty-fifth and succeeding years only I would be cut, as each area would contain in turn the same number of trees of 25 in. diameter and over as it did when estimated, provided the estimates and calculations had been correctly made.

There were two principal objections to working in this way, and they were—

(1) Owing to the difficulty of making accurate estimations and calculations in such irregularly grown forests, it was dangerous to get rid of all surplus stock at once.

(2) By cutting all the extra accruing increment in this way, the annual outturn would increase by 1/24 each year on the outturn of the first year, until in the twenty-fifth year it would fall suddenly again to its original amount.

Accordingly, it was laid down, in the original plan, that only half the extra increment was to be removed in the first period of 24 years, and that the remaining half was to be removed in the second period. Therefore the fellings during the first two periods were settled as follows:—

In the 1st year	I to be cut	In the 25th year	I to be cut
2nd	$I+\frac{I}{48}$	26th	$I+\frac{I}{48}$
3rd	$I+\frac{2I}{48}$	27th	$I+\frac{2I}{48}$
.....	.....	.....	.....
24th	$I\times\frac{23I}{48}$	48th	$I\times\frac{23I}{48}$

(and in the 49th year and after, I to be cut.)

By this arrangement firstly the danger of over-cutting was avoided in the first period; secondly, the sudden fall in the 25th year was reduced by one half. The amount of selection that could be made was also much increased.

In the interval between the estimates and the application of the Plan irregular fellings were to be, and were made over large areas, and, as no lists of (the number of trees felled were kept compartment by compartment, the compartment being the unit for estimation), it was not possible to know how many trees over 25 in. remained in each of the different compartments. Accordingly, it was originally laid down that, when there were calculated to be, say, *n* trees of 25 ft. and over on an annual cutting area and the number of these *n* trees to be cut was, say, *c*, and therefore the number left uncut was n—c, the work should be commenced by reserving the calculated number n—c of the best trees over 25 in. in diameter; after which the remaining trees over 25 in. were to be felled. This

would have compensated for the irregular cuttings that had been made during 8 years beginning with the commencement of the estimation. It would also prevent over-cutting on areas which had been overestimated.

But this method of reserving a number of trees over 25 in. calculated to remain after exploitation was objected to and discarded as, although it prevented overcutting and was the only possible way of really carrying out the idea of the plan after the irregular fellings had been made, it had the disadvantage of not ensuring large outturns during the first few years of the first period; the reason for this disadvantage was that most of the trees had been removed from the areas which it was thought desirable to commence the cuttings on, not for any scientific reason, but because these areas happened to be the most cheaply workable. So the plan was altered, and these selections were avoided.

The more remote parts of the area, which had been previously but little worked and which most required working, were purposely left to the last; the easily worked parts which had been already heavily cut over being chosen for the first years of the period simply for financial reasons.

The following modifications were afterwards made in the plan:—

(1) It was decided, without any reason being given, that all the extra increments should be removed in the first period, instead of reserving half for the second period. The disadvantages of this have been shown above.

(2) It was decided that, although in no case should the fellings be made, except in the areas laid down for each year in the plan, still, where more than the number of trees laid down to be felled were found on the area, all those above 25 in. in diameter should be felled.

It was imagined that, while in the first case overcutting was provided against by the area check, in the second case undercutting would be avoided. But such is not the case.

The plan lays down the area to be exploited once for all. When the estimated number of trees is not obtainable, it proves that the number of trees has been overestimated, or that trees have already been felled on the area since the estimation was made, or both. If the number has been overestimated, the fellings should obviously be further restricted than by merely forbidding the working, against the rules of the plan, of additional area. Where the calculations show that a certain number of trees over 25in. should remain after exploitation, it is evidently overcutting to remove the n—c trees. Similarly, where the actual number of trees over 25in. is greater than the calculated c (as should always be the case), there is nothing to justify the cutting of all trees over 25 in. For, according to the calculations n—c should be left. The original plan was so made that blind haphazard fellings of all trees above

25 in. were not possible. Selections were to be made, and the best of the larger trees reserved. As explained above, not only has this been prevented by the modifications introduced but whereas only a certain number of the trees over 25 inches were calculated to be available for felling, this number has been increased contrary to the provisions of the plan and without reason.

In many cases, according to the calculations, owing to the large proportion of trees over 25 inches, supposing they were all to be cut, it would take 50 years, if not more, to produce the required number of large trees to replace those felled. Whether the smaller trees, *i. e.*, those of the antepenultimate class and earlier classes would ever grow to 25 inches in sufficient numbers even then, is doubtful, owing to the bad quality of many of the trees.

It is accordingly evident that these changes upset the whole plan, by reducing the supply of large trees during the second period, and by making it impossible to make those selections which would have done much to compensate for the shortcomings of the original plan. As it now stands, the plan is simply an arrangement for felling all the fastest growing trees in the next 24 years, thereby swelling the revenue of that period at the expense of the future.

A thorough examination of the Kanara teak trees shows that they differ enormously on different soils, and side by side, in their rate of diameter growth. This rate of growth in diameter is the basis of the calculations used in the plan.

The teak tree is a light-demander inasmuch as, to grow fairly well, it requires plenty of light and room ; a shade-bearer, inasmuch as it is only completely suppressed by the other trees after a struggle of perhaps hundreds of years. We find trees with a growth half an inch in radius in one year in abnormal cases of quick growth, while the growth is frequently so very slow that the rings cannot be counted at all, even with the aid of a powerful lens. Standing side by side will be found two teak trees, each over 100 in height, one 25 in. in diameter and 200 years old, the other perhaps older but only 12 inches to 16 inches in diameter. A very important point to notice is that over the greater part of the area the majority of the trees over 25 inches in diameter are growing well, while most of those below 25 inches, excepting the very small trees, are more or less suppressed, and are growing but slowly.

Accordingly, to cut a large number of trees over 25 inches is to lower the rate of growth. It is therefore a mistake to fell the largest trees, the mature trees being, as a rule, not the largest, but the half grown.

On over 1-5th of the whole area, *i. e.*, east of the Kalinadi, the growth is very inferior, chiefly owing to forest fires, a poor, badly drained soil, and a want of cover, and, last but not least, the cutting out of the best trees in these conveniently exploited areas. The rotation of 180 years is undoubtedly too long for these parts, and the trees might with advantage be cut before they reach 25 inches, a size to which sound trees in these parts now seldom

grow. Here we have a mistake made in leaving all the trees to reach 25 inches, whereas the majority cannot well last till then ; the converse mistake, in addition to this one, is made on the rest of the area, where all trees on reaching a certain size are to be cut whether mature or not. Fellings made in this way have little right to be called Selection Fellings.

A noticeable feature in the utilization of data for preparing the plan is the neglect of height growth. Although many data concerning this were collected, no use was made of them and the importance of the height growth as a general indication of the relative proportionate lengths of rotation suitable in different places, is not recognised. A glance at the short growth in the eastern parts shows that it cannot bear such long rotation as the rest of the area.

For several years the amount of large timber exploited has been very large. In 1892-93, and 1894, large quantities remained unsold, the market being glutted. This large supply of large timber makes it hard to get a sale for timber of 15 inches to 20 inches in diameter. It is now proposed to increase the out-put, the average increase during 24 years, being estimated at 70,000 to 80,000 cubic feet per annum ; but this is on the supposition that only the amount originally laid down in the plan is to be cut. As all the trees to be felled are 25 inches and over, the glut of large timber will increase, and the demand for smaller material will be very poor.

The two principal results of this are :—firstly, that, whereas it is already impossible to make financially profitable thinnings of small, slow growing, partly suppressed trees of 8 inches to 14 inches in diameter, it will be now impossible to get the larger suppressed trees of 15 inches to 20 inches profitably removed on the required scale : they must be left to die ; secondly, the area, for which the plan has been made, includes the greater part of the best teak forests of North Kanara, and in addition to this area there is a larger extent of second rate and third rate teak forest extending into the Belgaum and Dharwar Districts ; these forests require to be taken in hand and worked, were it only to preserve the shade-giving jungle woods which, on inferior localities, get ousted by the teak, leaving dry, deteriorating, pure teak forests. But there is another reason for working these forests, and that is on account of the large amount of mature teak of moderate dimensions which would fetch a fair price, were only the sales of the larger timber restricted. The larger timber, however, being naturally preferred to the smaller, although it is not necessary in such large quantities to supply the known demand, has been alone exploited to such an extent that there is no demand for the rest ; consequently the inferior forests are neglected. The effect of further increasing the outturn of large timber is of course to diminish the likelihood of there being any market for the mature trees of the inferior forests.

To sum up the objections to the plan briefly, they are the following :—

1. The area for which the plan has been made has been irregularly exploited since the estimates were made, and hence the proper fellings have been interfered with. This difficulty has not been met by any modification of the number of trees estimated.

2. The amount originally calculated to be cut has been increased contrary to the provisions of the original plan, and for reasons that will not bear examination, while the fellings to be made in the 25th year are only half of the outturn in the 24th year.

3. The plan provides for the exploitation of immature timber, while it does not provide for the due removal or mature timber and it renders the latter, together with desirable thinnings, financially unprofitable.

4. The forest is to be so worked that it will be next to impossible to exploit neighbouring areas of large extent which urgently require to be worked.

The Bombay Government have approved of the proposal that in the event of the Conservator of Forests finding that the supplies in depôts get too far ahead of the demand, it shall be left to his discretion to curtail girdlings and cuttings at any time. When once a plan has been made, it is advisable to stick to it for a definite period. If it be interfered with, the plan cannot be afterwards corrected properly. In the present case there is every reason to fear that if girdlings were restricted, in the absence of any proper system of selections, the worst trees would be left and the best girdled. Were the outturn of large timber so regulated in the plan that there would never be a glut, and were it laid down that the Divisional Forest Officer should be responsible for the reservation of all the best trees of, say, above 15in. before the exploitation of any area, no such necessity could arise for irregular interference, at unstated times, with the proper carrying out of the plan; and, in addition to the preservation of the best timber being effected, it would be then possible not only to get rid of much inferior growth on the area covered by the plan, much to the benefit of the forest, but to exploit the, at present, unmarketable mature trees of the inferior forests, the proper management of which is more urgently called for than that of these superior forests.

C. HODGSON.

System of Measuring and Selling Timber in Siam.

A short description of this may be of interest to readers of the *Indian Forester*. The Siamese long measure is as follows:—

4 Kabiet	...	1 Niu ($\frac{5}{6}$ English inches)
5 Niu	...	1 Kam (of semi-girth)—($8\frac{1}{3}$ in. girth)
12 „	...	1 Köp.
2 Köp	...	1 Sawk (20 English inches)
4 Sawk	...	1 Wa (80 „ „)

The length of a log is always stated in Wa and the girth in Kam, but as the Kam represents only the semi-girth, a log of 6 Kam will girth actually 60 Niu or 50 inches.

The system of buying or selling timber is ingenuous; cubic measurement is unknown, so a standard of sale has been evolved. From what period this standard dates I have not been able to discover, but it is clearly not of recent origin; it is called the "Pikat Nua" or Northern tariff, and nearly all timber in the round is sold by the "Pikat Table." This table is given at the end of this note, and it will be seen that a value in Ticals (the silver coin of the country, equal to about 17 or 18 annas) has been given to logs of each dimension. When the table was compiled it is probable that these rates represented the actual value of teak timber, but this is no longer the case, for the Bangkok market rate of teak is now from 6½ to 7 Pikat, that is to say, a log will now fetch 6½ to 7 times the number of Ticals shown in the Pikat table. When a raft of timber is to be sold, it is the number of Pikat that is mutually arranged, instead of the rate per ton, as in Burma.

Duty is levied more or less according to the Pikat table, but the amount of duty leviable is stated for each dimension, and it will be seen that this does not follow the Pikat table exactly. It is presumable that the duty was fixed in comparatively recent times and represented the *comparative* value of the timber at that time, but neither the Pikat nor the Duty Table now represent the comparative value of the logs, as may be seen by converting a few of the Pikat measurements into cubical measure.

The system of measuring timber for duty is that adopted throughout the country, and is briefly as follows:—Two men measure the logs and a third enters the measurements on a slate from which he makes up the bill later. One of the measurers carries the "Mai-wa," or measuring stick, which is a wooden rod 2 in. square by 80 in. long and shod at either end with a metal boot. On one face the Mai-wa is divided into 4 Sawks, and on the other into 19 $\frac{1}{5}$ Kam. The length of the log is measured by stepping the stick along the log. The second man is armed with a strip of rattan about ¼ in. wide, nicely smoothed, which may be of any length but which is usually about 10 ft. long and attached at one end by a 6 inch snood to a cigar-shaped wooden float about 2 in. in diameter and 8 in. or 10 in. long. To measure the girth the float is pushed some distance under water and then shot under the log—up it bobs on the far side, where it is dexterously caught by the Wa-stick and the rattan is tightly stretched round the log; the point of contact being held firmly in one hand, the rattan is withdrawn, *doubled in half* and measured on the Wa-stick. The length has been measured at the same time and reading off the semi-girth the man with the Wa-stick calls out "7 Wa, 6 Kam" or whatever the measurements may be. With a little practice the length can be correctly estimated, 4 times out of 5, and occasionally there are

whole sections of rafts containing logs of the same (Wa) length, only one of which need be measured.

There are several customs which I should imagine have originated in the "good-will" of the Revenue Collectors, as they are all in the interests of the owner. One of these consists in raising the half limit to three quarters; thus a log is not counted as 6 Wa unless it is at least $5\frac{3}{4}$ Wa. Similarly, with the girth, only more so. To count as 6 Kam a log must be at least $5\frac{4}{5}$ Kam, any log between $4\frac{4}{5}$ and $5\frac{4}{5}$ counting as 5; this is on the semi-girth it must be remembered, so that in reality a log measuring between 41 in. and 49 in. is counted as 42·5 in (omitting fractions).

Again a rattan admits of a good deal of stretching and it is allowable to pull it as tight as possible on the log, but when the same is transferred to the Mai-wa it is customary to put one finger in the loop of the doubled rattan and just pull it taut, the difference between the stretched and slack rattan with the space on the latter taken up by the head round the finger is a by no means negligeable quantity. When it is added that the Wa and Kam are not fixed by Statute but vary in length, according to locality, and that the officials who measure timber, paying from 3 to 4 lakhs of revenue a year, draw from Rs. 13 to Rs. 17 a year and are subject to no check whatever, it must be admitted that the trade is not unduly hampered!

For sawn timber, the unit of measure is the "Yok" which is a plank 1 Sawk (20 in.) wide by 16 Wa (106 ft. 8 in.) long. The rate per "yok" varies with the thickness of the timber, thus planks—

1	Niu	thick	sell	for Tcs. 10	per Yok
2	,,	,,	,,	18	,,
3	,,	,,	,,	24	,,
4	,,	,,	,,	34	,,

but of late years the business in teak planks having passed to the hands of European firms, with saw-mills, the "Yok" is dying out as a unit of measurement.

Pikat Table with Duty Rates.

Girth in Kam.	Length in Wa.													
	3		4		5		6		7		8		9	
	Ticals	Duty	Tics	Duty	Tics	Duty	Tics	Duty	Tics	Duty	Tics	Duty	Tics	Duty
5	0·50	0·40	1	0·50	1·50	0·75	2	1·00	4	1·25	6	1·65	8	2·50
6	1	0·50	2	0·75	3	1·00	4	1·25	6	1·65	8	2·50	10	3·50
7	2	1·00	3	1·40	4	2·00	6	2·65	8	3·15	10	4·40	13	5·15
8	3	1·50	4	2·00	6	2·50	8	3·65	12	4·40	14	5·15	16	5·50
9	4	2·00	6	2·65	8	3·65	10	4·40	16	5·50	20	6·75	22	7·65
10	5	2·65	8	3·50	10	4·40	12	5·65	20	6·75	24	7·65	26	8·75
11	6	3·50	10	4·00	12	4·75	16	6·40	24	7·65	28	9·50	32	10·15
12	7	4·00	12	4·75	16	6·40	20	8·00	28	9·50	32	10·15	38	11·25
13	8	5·15	14	5·65	20	7·65	25	8·75	32	10·15	36	12·00	44	13·50
14	10	5·65	16	7·65	24	8·75	30	10·40	36	12·00	42	13·00	50	16·00
15	12	6·75	20	8·75	28	10·40	34	12·00	40	13·00	48	16·00	60	19·00

The Pikat table does not consider logs of smaller dimensions than 3 Wa by 5 Kam, but the duty table goes down to very small logs which it is useless to show here. These rates are for teak timber which is almost the only wood in which any trade is done but there is a duty table for woods other than teak which is generally about half that for teak.

H. S.

CHINAT, SIAM,
8th October 1896.

Life History of Melasoma populi in the North-West Himalayas.

The larvæ of this beetle are commonly found feeding on the leaves of *Salis elegans* at elevations varying from 6,000 to 9,000 ft. in the Jaunsar Forest Division in sufficiently large quantities to quite defoliate the small trees, on the leaves of which they feed. They are also occasionally found on the leaves of *Salix daphnoides* and *Populus ciliata* at slightly lower elevations.

The eggs are laid in clusters of 40 or 50 on the under surfaces of leaves, and the young larvæ apparently hatch out about 4 days after the eggs are laid.

The larva changes its skin twice before it becomes comatose preparatory to turning into a pupa.

The first change takes place 4 days after the larvæ are hatched. After another 7 days the larvæ again change their skins, and at the end of another nine days they become comatose. They usually remain is this state stationary, and without taking food for about 2 days and then pupate. The insect remains in its pupal state for 8 days, after which time the fully developed beetle emerges.

The larvæ are attacked by two parasitic flies, one of which is believed to be a species of *Tachina*.

The parasites in both cases develop with and live on the larvæ. In each case the larva of the parasite develops into a pupa at the same time as the larva of the beetle becomes comatose preparatory to turning itself into a pupa. The pupa case of the *Tachina* resembles in shape and colour a very minute German sausage, and one fly emerges from each beetle pupa. In the case of the other parasite, a number of pupæ (6 to 10) are developed in each pupa of the beetle. Pupæ of both parasites can be distinctly seen inside that of the beetle.

The following is a description of the fully developed larva. A full grown larva is 0·50 inch long and 0·23 inch wide at the

largest part. It has six thoracic legs. Two prolegs are developed, one on either side of the anus on the last abdominal segment. These are used as legs when the larva walks. The head and legs are jet black, the rest of the body being of a yellowish white colour. A pulsating movement is very distinctly visible down the centre of the upper surface of the body of the larva.

The first segment of the thoracic region has a black horse-shoe shaped mark on its dorsal surface. The two other segments of this region have 10 small black dots on them and two glands, one near either side of the body. Four of these dots are on the sides of the larva, two or either side ; and two sets of three dots arranged in the form of an equilateral triangle with its apex towards the centre of the body are on the dorsal surface.

The next six segments (the first six of the abdominal region) have each two rather transversely lengthened black dots arranged equi-distantly from the centre of the body. On each of the abdominal segments also there are two glands, the whole forming with the glands on the thorax two longitudinal rows on either side of the insect. When the larva is disturbed, it protrudes from each gland a transparent globule of liquid, which smells very strongly of oil of almonds (prussic acid) and serves no doubt as a protection against birds. These globules are withdrawn after a few seconds and the insect does not seem to have the power of protruding them again for some little while. The presence of the larvæ can generally be detected, if they exist in fair numbers, by the smell emitted by them, long before they are seen on the tree.

The abdominal end of the pupa is enclosed in the skin which is last thrown off. The pupa has the same markings and colouring as the full grown larva, but the yellowish parts become much darker at the end of the first or second day. The antennæ, wing cases and legs are distinctly visible in the pupa, the first two pair of legs are above and the third pair below the wing cases.

The beetle is fairly constant in size and is $\frac{3}{8}$ inch long and $\frac{1}{4}$ inch wide. The head, thorax and abdomen are bluish black in colour, and shiny ; while the wing cases are large, cover the abdomen completely, semi transparent, and vary in colour from light amber (when newly emerged) to light brown when fully developed. The beetles have been seen eating leaves, but do but little damage compared to their larva.

The following information and measurements are taken from my rough notes on some larvæ of *melasoma populi* kept in confinement and reared from eggs found on the lower sides of the leaves of *populus ciliata* and *salix daphnoides* in the second week in May 1894.

The eggs are 0·08 inch long and 0·03 inch wide at the broadest part. They are light yellow in the centre and semi-transparent, being darker in the centre than at either end. The larvæ, when first hatched, have not got sufficiently strong

mandibles to bite through a leaf and they consequently only eat off a part of either the upper or lower surface.

The larvæ were carried about with me on tour and were fed on such species of willow as were found at elevations of from 3,000 to 8,000 ft. and did not seem to suffer from the considerable changes of temperature they were exposed to. They ate the leaves of all the different species of willow that I gave them.

The larvæ when hatched were 0·05 inches long on an average, and protruded globules of pungent colourless liquid just as the full grown ones did. They feed in clusters when very small. Immediately after the first change of skin, their average length was 0·23 inch. Just after the second change of skin they were on an average 0·40 long and 0·15 wide at the broadest part. The black horse-shoe shaped marking on the first thoracic segment appears just after the first change of skin. When full grown the larvæ were half an inch long.

C. GILBERT ROGERS.

II.—CORRESPONDENCE.

What Constitutes a Thinning?

ARE THINNINGS ADMISSIBLE IN FORESTS UNDER JARDINAGE?

I read with much interest the discussion which took place in your pages towards the close of last year between Messrs. C. P. Fisher and Smythies, of the two questions heading this letter, but being away on leave I was unable, much as I wished to do so, to take part in it. The two subjects of thinnings and of a rational jardinage are, however, of perennial interest all the world over and I need not therefore apologise for the lateness of the remarks which follow.

I will deal with the two questions in the order in which they have been propounded above.

Mr. Smythies begins his reply to Mr. Fisher by assuming, very rashly I must say, that but few of his brother foresters understand what a thinning is, and asserts, with an emphasis which requires special type to denote it, that "*the removal of dominated trees has nothing whatever to do with a thinning*" and "*does not improve the growth and vegetation of the crop one iota.*" Having made these sweeping statements, he proceeds to "quote the best French authorities" in support thereof. Reading on, we find that these "best French authorities" resolve themselves into the honoured names of two Nancy professors. But if the mere quoting of authorities, however eminent, apart from observed facts sufficed to

settle disputed points, Medical Science would still be at the stage when Galen wrote, and students who now study chemistry would be practising the glorious art of alchemy. Moreover, against the two authorities cited by Mr. Smythies could be brought more than two score not less eminent authorities who have made the subject of thinnings the special study of their lives.

Now, Sir, it is notorious that until the institution of bureaus for forest research on the European continent in the seventies, pure empiricism reigned supreme in the treatment of forests. Wide generalisations were made from one or two isolated facts, and theories were built and propped up mostly with *a priori* reasoning, by professors out of all touch with forests, except on the rare occasions afforded by short excursions with students, when only very superficial observation was possible. As a result of the facts already brought to light through the labours of the research bureaus, many cherished beliefs, which in my student days it was rank heresy to question, have disappeared into the limbo of forgotten things, and in no branch of sylviculture has a more complete revolution been worked than in that of thinnings.

Mr. Smythies completely, but I hope not willingly, ignores the existence of German investigators and of the vast system of colloborated inquiry, which they have organised and pursue with such ardour and singleness of purpose, into the laws of forest growth; and he is apparently unaware that, with but few exceptions, thinnings in one-aged pure crops in Germany, Austria, and Switzerland, are confined exclusively to the removal of the suppressed, sometimes also the merely dominated, individuals. In other words, the whole body of German Forest Officers, who, as a body, easily take the first place of all the world for a practical as well as a theoretical knowledge of their profession, stand condemned by Mr. Smythies as not knowing what a thinning is! But as he chooses to rely only on France for his justification, I will not go outside the limits of that country for his refutation.

Among the few experimental plots which the French Research Bureau have selected for its investigations, is a series of three plots situated side by side. In the first of them *éclaircie par le bas* is uncompromisingly carried out, that is to say, all overtopped stems, whatever their condition (*quelque soit d'ailleurs l'état de leur végétation*), and only these, are cut out; in the second, the system of *éclaircie par le haut* (the system taught by the Nancy School and the only one which, in Mr. Smythies' opinion, deserves to be called a thinning) is practised *; while in the third and last, nothing was

* For readers of this paper, who have not been taught at Nancy, it is necessary to specify more in detail what this thinning is. All suppressed and dominated individuals that are neither dead nor dying are preserved, and the operator confines his attention to the dominant storey in order to free, to the desirable extent, the crowns of picked individuals by clearing away the less valuable surrounding individuals which hem them in too closely.

to be taken out except it was dead or on the point of dying (*on y cueillait simplement les tiges mortes ou sur le point de périr*). I have used the word "was" advisedly, as a few years ago it was found that the crop was being irretrievably ruined owing to the absence of thinnings, and this fact being established beyond doubt, the crop has been thinned and thrown out of the experiment. This fact will be prominently recalled lower down.

The experiment was begun in April 1883, at which date, the age of all three crops being 27 years, their condition was as follows, all figures being reduced to the hectare as unit of area :—

A

	Plots. I	II	III
Total number of stems	13,390	11,996	15,676
Percentage of beech stems (the rest were oak, hornbeam and others)	64	67	82
Total transverse sectional area of stems at 1·30 m. off the ground, square metres	23·32	24·96	27·66
Total volume of standing material cubic metres ,,	145·5	157·4	167·5
Mean annual increment since origin of crop, cubic metres	5·39	5·83	6·20

Plots I and II were thinned, in the manner above described, immediately after the valuation survey had been made, which furnished the figures given above. There were apparently no dead or dying trees in Plot III, as nothing was taken out of it. The thinnings being effected, the standing stock was as under :—

B

	Plots. I	II	III
Total number of stems	4,116	11,504	15,676
Percentage of beech stems	66	67	82
Total transverse sectional area of stems 1·30 m. off the ground, square metres	18·46	21·73	27·66
Total volume of standing material, ,, ,, cubic metres	123·3	134·9	167·5

In October 1887, after five growing seasons, the crops being 32 years old, a valuation survey gave the following results :—

C

	Plots. I	II	III
Total number of stems	4,116	11,504	15,676
Percentage of beech stems	66	67	82
Total transverse sectional area of stems at 1·30 m. off the ground, square metres	23·35	26·53	32·25
Total volume of standing material ,, ,, cubic metres	163·2	174·2	205·0
Mean annual increment since origin of crop, ,, ,, cubic metres	5·79	6·15	6·40
Current annual increment during past five years, ,, cubic metres	7·98	7·86	7·50
Rate of increase per cent. of entire stock standing in April 1883, cubic metres	6·47	5·83	4·48

Thus in the 5 years the following amount of increase had taken place under each of the undermentioned heads :—

D

	Plots. I	II	III
Total transverse sectional area of stems at 1·30 m. off the ground, square metres	4·89	4·80	4·59
Total volume of standing material ,, ,, cubic metres	39·9	39·3	37·5
Mean annual increment since origin of crop ,, ,, cubic metres	0·40	0·32	0·20

The mean annual increments, up to the initiation of the experiment, of the several crops (Table A) prove that the conditions of growth were best in Plot III, next in Plot II, and worst in Plot I. Whatever the effective causes for this difference, some of them were certainly permanent ones traceable to the constitution of the crop and the nature of the soil and situation.

Nevertheless, in the five growing seasons following April 1883, as shown by Table D and the last two items of Table C, the removal of nothing more than the dominated stems, which, according to Mr. Smythies, ought not to have improved the growth and vegetation of the crop "one iota" really effected so appreciable an improvement that in October 1887 Plot I not only showed better than Plot III, which had not been thinned at all, better even than Plot II which had had the benefit of Mr. Smythies' ideal thinning. Here we must also recall the fact, already mentioned before, that in the succeeding 5 years the condition of the individuals composing Crop III had, in the absence of any kind of thinning, become so precarious that the crop had to be thinned at once to save it from hopeless ruin.

Thus the dominated storey of a crop, which Mr. Smythies, with the support of his French authorities, so utterly despises, is a very powerful factor indeed in the struggle for existence. What then becomes of his assertion that its removal "does not improve the growth and vegetation of the crop one iota"?

Having, as I hope, completely disposed of a most dangerous doctrine which Mr. Smythies has attempted to set up in arguing against his opponent, I will turn to his definition of what constitutes a thinning. He says that "a thinning is an operation which consists in giving sufficient growing space to the more promising individuals in the region of the crown," and, apparently quoting Boppe, adds that "the strict conservation of intermediate storeys and all shrubby growth is the fundamental basis of all thinnings." What is the logical consequence of such a rule? It is that the individuals in the overtopped storeys are not utilised until they are dead or on the point of death (see foot-note on page 432). Surely any operation, one of the essential objects of which is to

leave a part of the crop to die or reach the point of death before sending it to market, is radically wrong.

Another necessary consequence of the rule for thinnings given by Mr. Smythies is loss of growth, and especially of the production of timber. Given a certain soil, situation, and climate, and certain species, the quantity of wood standing on unity of area at a given age cannot exceed a certain maximum, but, according to the character of the thinnings made, this maximum may be distributed over a greater or smaller number of stems. The quantity being the same, the smaller the number of stems, the larger will be the quantity of timber, and *vice versâ*. Now the preservation of all the suppressed and dominated stages of growth means a correspondingly large number of stems. Let us go back to our experimental plots for an instance. The average quantity of wood, in cubic decimetres for trees in Plots I and II at the different times was as follows:—

	Plot I	Plot II
Just before thinning	10·4	13·1
Just after thinning	30·0	11·7
Five growing seasons after thinning	39·7	15·1
Total increment per stem during the five seasons ...	9 7	3·4

Comment is superfluous.

In a passage lower down, Mr. Smythies, after repeating what I have proved to be the utterly groundless assertion that "the removal of trees fairly dominated would not have the slightest effect on the crop," adds, without, however, seeing the self-contradiction, that "in most cases in India it would not be justified." If a certain operation has no effect one way or the other on the crop operated upon, what objection can there be to it from a sylvicultural point of view, which is evidently that on which Mr. Smythies takes his stand.

The subject of what constitutes a thinning in different circumstances is such a vast one that an entire number of the *Forester* would hardly suffice to treat it adequately on the basis of facts and not merely *a priori* assertions of different individuals who have each some pet theory to inculcate. I have therefore strictly confined myself to showing, by means of a single rigidly scientific example, that Mr. Smythies, while unjustly disparaging his brother Indian foresters and hurling "the best French authorities" at their devoted heads, has assumed a totally untenable position.

The next question is, "Are thinnings admissible in forests under jardinage"? Mr. Smythies says emphatically NO; and so does, I am surprised to see, the oracular, omniscient, would-be-infallible editorial WE.* Mr. Smythies considers that thinnings can be made only in "a fairly uniform crop more or less of the same age" and further on says that "the very definition of the selection method at once shows that thinnings are not contem-

* We are not aware of having ever put forward such pretensions.—*Hon. Ed.*

plated." I assent to this latter statement if we accept the antiquated definitions of the method given in the text-books on which Mr. Smythies relies. Those definitions reduce jardinage to the utilisation of superannuated trees, most of them in full decline, a few sound ones being incidentally thrown in in order to make up the fixed annual yield or to satisfy the market. *

But since the days when Mr. Smythies and I imbibed together our first notions of forestry, while the Nancy Forest School has stood still, the Forest Department of France has been advancing apace in the direction of jardinage, so that, as I have shown in my Report (in the Press) on Forestry in France, that system actually takes first place in the treatment of silver-fir forests over the very much misnamed *méthode du ré-ensemencent naturel et des éclaircies* (as if jardinage excludes either natural regeneration by seed or thinnings).

Against Mr. Smythies' contention it will suffice to quote the official orders issued in 1892 by the highest directing authority of the French Forest Department, viz: the *Conseil d'Administration*, composed of the *Chef du Cabinet* as President, the *Directeur des Forêts* as Vice-President and the several *Administrateurs* as members. † These orders have reference to ordinary, every-day jardinage, not to some special system of jardinage.

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* I cannot do better than quote here from the *Indian Forester* of March 1889. "The discredit into which it (jardinage) has fallen is due in a great measure to the teaching of the Nancy Forest School. Parade returned from Germany, at the beginning of the third decade of this century, full of the new gospel preached by the great Cotta, whose pupil he had been. With the enthusiasm characteristic of all young men, he wrote an apotheosis of the *Méthode Naturelle* in his celebrated work "*La Culture des Bois*," which after nearly half a century still remains, without any important alterations, the text-book at Nancy. Nanquette, Bagneris and Broilliard, all three pupils of Parade, continued to teach the unrivalled excellence of the method by disparaging every other, inclusive of jardinage. Thus Bagneris in his "Manual de Sylviculture" says, "jardinage consists in felling here and there, wherever they chance to be found, trees that are *dead*, *decaying*, *unsound* or *past maturity*, and a few others that are still healthy to meet the demands of the market." Again Broilliard in his "Cours d' Aménagement" says, that the method is "simply the exploitations of *primitive humanity* generalised into a system," and lower down he adds that it "consists in the removal here and there of the oldest trees, of those *dying*, *decaying* or *dead*, and of others still in full growth, but which are required to satisfy the wants of the proprietor." The italics are in every case ours. Both these writers prejudice the system at the very outset by declaring that its essential characteristic is to make the forest yield unsound wood, sound timber being cut only to satisfy the market or the wants of the proprietor. This is surely a most unfair way of putting things. Why, if we take any class of fellings in their own favourite *Méthode Naturelle*, a forester marking a coupe must necessarily first of all mark for felling the dead, dying and decaying trees, and only after these, in order to make up the balance of the fixed yield, the sound healthy, growing trees whose removal is required in the interests of the surviving neighbours or of the regeneration."

† I need hardly remark here that the teaching of the Nancy Forest School is in direct conflict with actual practice in a great many, even essential points.

"In the method of jardinage the same operations are required as in that of the regular high forest, with this sole difference that these are restricted to small plots scattered all over the forest, but which have to be attended to at each return of the fellings."

"From this it follows :—

(1) "That the rules for jardinage should vary with the species composing the forest. Thus, for instance, for spruce, which is less shade-enduring than the silver-fir, the seed-fellings ought to be more open ; hence a less confused mixture of ages and the necessity of making wider openings in the leaf-canopy at each point."

(2) "That whatever the component species, the seed felling cannot be considered complete unless, besides opening out the upper storey, it also thins out strongly the under-storey formed by broad-leaved species, the soil being at the same time freed of weeds."

(3) "That we must not restrict ourselves only to the utilisation of large trees, but that within the limits of each coupe we must *carefully carry out all the cultural operations required, thin over-crowded parts, remove poles without a future* and never forget that the really profitable part of whatever increment takes place is that which is added on to picked trees destined to be maintained up to the full age of exploitability. Such increment will sell as timber, consequently there should be no hesitation in sacrificing, in order to favour the development of those picked stems, backward or sickly stems, which would in any case have to be prematurely removed in a few years and whose increase of volume would therefore possess only a slight money value." *

* To leave no doubt as to the meaning of the order I have translated, I give the whole of it in the original French.

"La méthode du jardinage doit comporter les mêmes opérations que la futaie régulière, avec cette différence seulement que les opérations sont assises par petites places dispersées sur toute l'étendue de la forêt, mais sur lesquelles l'attention des agents est appelée à chaque rotation."

"Il suit de là :

"1° Que le jardinage doit être soumis à des règles variables avec l'essence qui peuple la forêt. Pour l'épicea, par exemple, qui supporte moins bien le couvert que le sapin, les coupes d'ensemencement doivent être plus claires, ce qui entraîne comme conséquence un mélange moins confus de tous les âges et l'ouverture du massif par taches de plus grande étendue."

"2° Que, quelle que soit l'essence, la coupe d'ensemencement n'est complète qu'à la condition de ne pas se contenter d'ouvrir l'étage supérieur, mais aussi d'éclaircir fortement l'étage inférieur constitué par les feuillus, en nettoyant le sol."

"3° Qu'on ne doit pas se borner à la réalisation des gros bois, mais que, dans l'enceinte de chaque coupe, il faut pratiquer soigneusement toutes les opérations culturales nécessaires, éclaircir les massifs trop serrés, supprimer les perches sans avenir et ne jamais perdre de vue que l'accroissement réellement profitable à la forêt est celui qui se porte sur les arbres de choix destinés à atteindre le terme de la révolution. Cet accroissement se vendra comme bois de service ; il ne faut donc pas hésiter à sacrifier, pour favoriser le développement de ces bois d'élite, le sujets languissants ou souffreteux, qu'en tout état de cause on serait conduit, peu d'années après, à exploiter avant terme, et dont l'accroissement n'aurait par conséquent qu'une faible valeur en argent."

Thus Mr. Smythies' position and for that matter, also that of the editorial *WE*, who should in future be less *cocksure* in his criticisms, is again utterly demolished without it having been necessary to go outside of France for arguments. If Mr. Smythies ever visits French forests again, I would advise him strongly to devote a few days to an examination of some of the Pyrenean forests and the terrible condition into which they have been brought by the literal carrying out of the rules for jardinage accepted by him. The necessity of possessing a clear and correct idea of what jardinage is cannot be too strongly impressed on the Indian forester, for, with rare exceptions, jardinage (including in that the group system) and storeyed coppice are the only two methods that can ever be adopted in India. Let us therefore have a rational jardinage, not the caricature of it given in the text-books of the days our youth. Jardinage will give us as abundantly as any other method every quality and class of timber, will enable us to work our forests whatever the demand, and is the only method of treatment that will guarantee protection to the soil and natural reproduction by seed in climates and soils to to be found over nine-tenths of the empire.

AJMERE ;
25*th* *September* 1896. } E. E. FERNANDEZ

The Germination of Teak Seed.

With reference to the letter signed Gokal Das in your September number, the following method has been tried in Ceylon. The seeds were spread on the ground on a mat about 4 inches thick and constantly watered in the sun, the heat quickly caused them to germinate and coolies had to be put on the 3rd day (as they sometimes germinate as fast as this) to pick out the germinating seeds.

These were then pricked out in nurseries, which are watered daily, morning and evening, and the first leaves appear above ground in a fortnight. A description is given in the March number (1895) of the *Ceylon Forester* of the method of planting teak. The method I have mentioned above should be only resorted to in fine weather, as, if the seeds are kept too moist and get no sun, they are apt to rot off.

JAFFNA, CEYLON ;
31*st* *October*, 1896. }

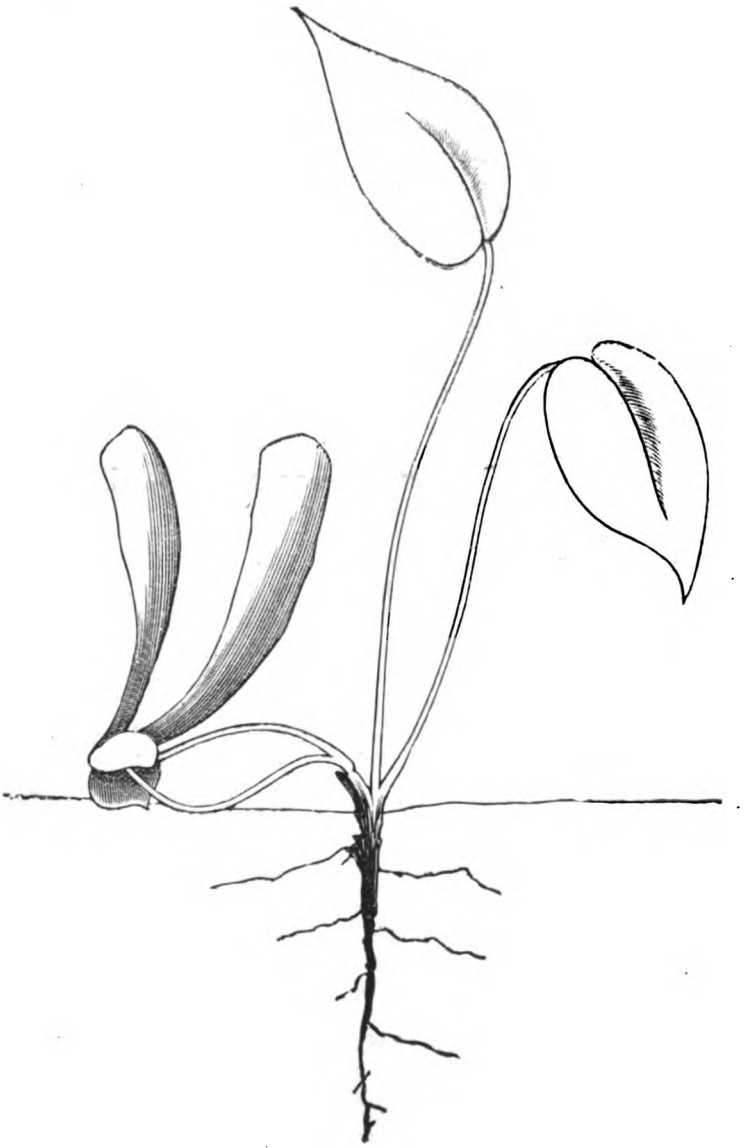
H. P. ARMITAGE.

The Germination of Sal.

I enclose a drawing of the mode of germination of sál. It appears to be much like that of the *Quercus Semecarpifolia*, as

shewn by Mr. Leete, I think, in the *Forester* some time back. I imagine that the system is specially adapted to the finding of a way through the thick coating of dry sál leaves to the soil beneath.

A. G. H.-H.



III.—OFFICIAL PAPERS & INTELLIGENCE

Note on Lac.

By M. Ridley, Esq., Superintendent of Horticultural Gardens, Lucknow, dated 6th June 1896.

Regarding the statement commonly made, and as generally believed, that "if lac is not removed from trees it will in time destroy the trees," I have practically demonstrated and proved in the most conclusive way that the above theory is incorrect and entirely at variance with fact. When I first came here, 23 years ago, the matter then came under my notice, many large trees in the Wingfield Park, Residency Grounds, and the station avenues, were badly infested with lac, and the plan then in vogue was to sell the lac to contractors, who in collecting it denuded the trees to a most objectionable extent. This led me to think of some way or means of keeping the trees clear of the pest. A Forest officer informed me that this could be done by lopping off all the leading branches and afterwards stripping the branches and stems of all leaves and twigs, the object being to divest the trees of all infected parts and to remove all trace of the lac insect and so prevent its breaking out on and spreading over the trees so treated again.

I adopted this plan with one or two trees in the Wingfield Park, but found it ineffectual, as on the new branches and shoots which were developed, lac again appeared as bad as before. This plan proved an entire failure to protect or keep trees clear of lac.

I then decided to stop lac collecting on a few trees to test and prove the theory about its destroying the trees. The result of this experiment was that after a time the lac all disappeared and the trees in a short period recovered from the effects of the lac and became perfectly clear and healthy again. This is absolute fact, and I can show numerous large *peepul* and *pahar* trees, which at one time were so infected with lac as to be most unsightly objects, now entirely free from the pest, and the trees healthy and vigorous.

On the representation I made to Mr. Boys, when Deputy Commissioner here, he passed an order prohibiting the sale of lac from trees in the station, and since then I believe no lac has been collected from trees on avenues and groves in Lucknow; certainly none has been collected from any of the gardens and other public grounds in my charge, and there has been no loss of trees in consequence.

For some years there has not been much lac on trees in Lucknow, at least on those in my immediate observation; but whether this decrease of lac pest is due to collecting being prohibited or to the seasons not favouring its spread, I am not prepared to pronounce an opinion, but the fact remains that it has been

much less in evidence for the past five or six years than it was for many preceding years.

I have often been told that the lac gatherers inoculate trees to spread and propagate lac. The results here rather favor that statement. Prohibition may have shown them that they gain nothing by spreading it, and this may have led them to cease inoculating trees ; but on this point conclusive and certain evidence is not forthcoming.

I most decidedly do consider that trees are injured by the way lac is generally collected, owing to the removal of such a large portion of the young twiggy growth of the trees.

Near, and in towns, the object of this free removal of twigs is two-fold : one to obtain as much lac as possible, the other to make money by selling the twigs for firewood. If proper and efficient supervision could be provided, lac might be removed to some extent by collecting dead twigs and a small proportion of the finer ones. The trees would not suffer to any appreciable degree if collecting was done in this way ; but, as the necessary supervision to ensure this is not available, prohibition is, in my opinion, the only safe method to follow.

The theory mentioned at the beginning of this note comes no doubt from persons interested in lac, and is a purely selfish one.

Others have accepted it from want of evidence to combat it, and so it has come to be generally accepted as fact. For this reason it would probably be useful to circulate the facts and experience given in this note.

VI—EXTRACTS, NOTES & QUERIES.

Reprint of the Forest Flora of North-West and Central India.

We are informed that it is proposed to reprint Sir Dietrich Brandis' *Forest Flora*. The publishers have offered to bring out a small edition of 100 copies if they can be assured of a sale at a published price of 15 shillings each, net, without the plates. We shall be very glad if any of our readers who may wish to purchase the work will communicate their names to us.

Forest Department Pension Rules.

Indian pension rules are discussed occasionally in the columns of the newspapers and periodicals at home. Thus the *Saturday Review* of October 10th contains some pertinent remarks on the cheese-paring policy of the India Office in regard to the pensions granted to Forest Officers. The line taken is much the same as we have adopted for a long time past, and the sympathy of the

public is invited for those who are so scurvily treated. When the case of the Indian Forest Officers comes again before Parliament, as it will do next session, the arguments in favour of more liberal terms can be very strongly put. It can be readily established that the pension charges of the department are not heavy. Leaving out of consideration a few officers recruited locally who were removed from the service on the ground of unfitness, we find that, out of 138 officers who have left the department since 1870, no fewer than 64 died with an average length of service of less than 10 years; 27 resigned with an average service of about 8 years, many of them being forced by ill-health to leave India; 15 more retired under actual medical certificate; and only 32 earned pensions under the ordinary rules. Of these, 11 came under military pension rules and only 21 under the civil rules, their average length of service being 25 years. During the period when these deaths and retirements were taking place the surplus revenue of the department rose from Rs. 8,56,000 in 1870-71 to Rs. 33,73,000 in 1893-94. It seems incredible that under these circumstances the Secretary of State should have refused the comparatively petty concessions which have been forced upon his notice as being equitable, on five different occasions by three successive Governments of India, and which would only involve an additional expenditure of Rs. 15,000 per annum. The Indian Forest Department is assuredly the cheapest in the world, for the death rate and early retirements among its officers are so high that the pension charges to the State are ridiculously small. The men who work in unhealthy jungles and lose health and strength in the public service are certainly entitled to generous treatment. But this is exactly what they have never got.—*Pioneer.*

In connection with the above, "Crying in the Wilderness" writes to the *Pioneer* as follows:—

"With reference to the refusal of the Government of India to ratify the Secretary of State's promise that every Forest Officer who serves with approval for 3 years as head of department (*i.e.* Conservator) should become qualified for an extra pension of Rs. 1,000 per annum in addition to whatever other ordinary pension he has earned, I would invite the attention of all my brother officers to the following facts:—

(1) Under C. S. R. Articles 690 (*a*) and (*b*) and Article 703, Coopers Hill and Stanley Engineers become entitled to the benefits of Article 714 regarding extra pensions;

(2) under Article 703 Engineers trained in Europe but appointed in India have been specially admitted to the same benefits; and

(3) under Article 704 "Indian College Engineers" and "other Civil Engineers" (whether of purely Asiatic descent or not) "appointed in India" "who may rise to the rank of Superintending Engineer" have had granted to them the assurance that "the

Government of India will be prepared to consider favourably their admission to the pension rules, including those contained in Article 714, applicable to the officers specified in Article 703."

That is to say, even the Secretary of State's Forest Officers, trained in Europe and appointed in Europe by the Secretary of State, are being denied the pensionary privileges which the Government of India have formally admitted that they are prepared to extend to men trained in India and appointed in India, even though the latter may be "*of purely Asiatic descent.*" It seems to me that this last point should be distinctly referred to by all those who are about to memorialise the Government of India for the full and complete ratification of the Secretary of State's promise made to Sir Richard Temple, Bart., in the House of Commons in 1893.

Schlich's Manual of Forestry.

Volume V. of this authority on all matters relating to forestry is concerned with the important subject of forest utilisation. Its basis is a work by Dr. Karl Gayer, the Professor of Forestry at the University of Munich, which is the recognised standard publication in the Fatherland. The amplification of Dr. Gayer's work has been admirably done by Mr. W. R. Fisher, B. A., the Assistant Professor of Forestry at the Royal Indian Engineering College, Coopers Hill, whose own work in France and India, as well as in this country, has enabled him to add many notes and illustrations, which are not the least valuable portion of the new volume. M. L. Boppe, the Director of the French National Forest School at Nancy, has also allowed Mr. Fisher the use of several excellent plates, and the illustrations, which numbered 297 in the original German edition, now total 343 in the present English edition. Dr. Schilch and Dr. Matthews have assisted the author and translator in revising the proof sheets, while the experience of Professors Hearson and Heath has also been available. A work which comes under such auspices is certain of favourable reception wherever forest-owners are desirous of utilising the wealth they possess to the fullest extent, and detailed criticism seems invidious.

The consumption of timber in North America and the North of Europe, the wanton clearances that are reported from some of the Southern States of the Transatlantic Republic, and the opening up of the forests of our own Colonies are questions concerned with the future prosperity of those lands; hence the publication of such a work as Mr. Fisher's "Forest Utilisation" is a matter of considerable interest. Part I. deals with the harvesting, conversion, and disposal of forest produce, the thirteen sections of which the first chapter consists exhaustively examining the technical properties and qualities of wood. The industrial uses of wood are

then considered, nearly a hundred pages being devoted to as many uses to which various timbers are put. The felling and conversion of timber, wood-transport by land and by water, with a clear comparison between different modes of transport, and the disposal and sale of wood are all authoritatively treated. The second part is concerned with the harvesting and disposal of minor forest produce, including the utilisation of bark, forest fodder, field crops in combination with forestry, the fruits and seeds of forest trees, forest litter, resin tapping, &c.

Auxiliary forest industries conclude the work. Under this heading the antiseptic treatment of timber, saw-mills, wood carbonisation, the digging and preparation of peat, and other industries are fully described and explained. From this brief summary of the contents of a volume with more than seven hundred pages its comprehensive character can be imagined, and it only remains to be said that the publishers—Messrs. Bradbury, Agnew, & Co., Limited—have presented the book in a fitting manner, and that its publication is a matter of congratulation to the translator whose work has been particularly well done.—*The Timber Trades Journal.*

Teak Plantations in Ceylon.

A few notes on teak planting may be useful to our readers, so we venture to give what has been our own experience.

The seed is as a rule obtained from India, and is of large size varying from one third to half an inch in diameter.

The plantations in Ceylon have, as a rule, been made from plants reared in a nursery, and plantations either from broadcast sowing or from seed sown at stake have not yet been tried sufficiently to give us any reliable data.

When plants have been grown in nurseries the following method has, as a rule, been carried out.

The land on which the nurseries are to be made is well turned over with mamoties, and all roots and stones carefully removed. Rectangular beds are then made not exceeding 4 feet in width, and length of about 15 to 20 feet. Between these, roads or paths are left for coolies to walk up and down when watering or weeding. The land is carefully fenced to prevent cattle coming in. These nurseries should be made in April or May, as planting in the low country always takes place in the North-East monsoon from November to January, and in order to have the plants 6 inches in height or more, they should be put out in the nurseries before the end of June. When the nurseries are ready, the seeds are spread out on the ground about 4 inches thick and constantly watered, the heat quickly causes them to germinate, and the coolies should be

put on the 3rd day to inspect the seed daily and to pick out all seeds that have commenced germinating.

If the soil is as it should be, rich in the nurseries, the seeds are placed 3 inches to 4 inches apart. The holes are picked to a depth of 2 inches, the seed carefully put in and covered over with earth.

The beds of the nurseries are watered every morning and evening, and in a fortnight's time the seed leaves will commence appearing above the ground. Should the sun be very hot every day, screens made of cadjans may be placed over the beds in the middle of the day from 10 o'clock to 4 o'clock in the evening to keep the mid-day sun off. Weeding should be carefully carried out, and by November the plants will be fully eight inches high as a rule.

Another system has been tried with the seeds and with equal success. Baskets commonly called supply baskets made of cane, and being about 4 inches in diameter and 9 to 10 inches in depth are carefully filled with rich soil and the germinated seeds put one into each basket. These are also watered daily and screened from the mid-day sun as is done with the nurseries. The great advantage of these supply baskets is that in planting out the plants afterwards no interference takes place with the root of the plant, and the plant suffers no shock when it is put into the ground. The objection to them is the greater expense; this amounts to about ½ ct. per basket or Rs. 6 per acre.

Teak plantations are generally made on forest land, flat with good soil, not too much exposed to wind and well drained. Teak does not like swampy land. If there is any sale for firewood, the clearing should be commenced in the year as soon as possible, so that all the firewood may be removed. After this is done the remaining forest and undergrowth is felled and allowed to dry, and in July or August it is burnt off, a space should be cleared for about a chain at least round the piece intended to be burnt, or the surrounding forest may be damaged.

The clearing costs about Rs. 15 per acre, not including the cost of firewood cutting, on which a profit should be made by sale of firewood. In October when the first rains fall the ground is lined and holed for planting. The most successful distance for placing teak apart is considered to be 6 feet; this gives 1,210 plants roughly per acre. Lining or putting in pegs to shew where the holes are to be cut is, as a rule, done with a rope and prismatic compass. The rope has pieces of coloured cloth let in at every 6 feet. A base line is then laid down with the prismatic compass at right angles to the prevailing wind, so that it may do as little harm as possible to the plantation. This line is carried right along the length of the clearing, pegs being put in at every 6 feet where the coloured cloth is on the rope, sometimes double pegs are put in to shew that this is the base line. Then with the prismatic compass, cross lines are laid out at right angles to the base lines, 40

yards distant from each other. This prevents the lines from running much off the straight, and then the intermediate lines are put in, one end of the rope being held at the base lines, with one of the coloured rags at the pegs, and the other end held parallel to the first cross line; to test the further end being in line with the cross line, the man holding the rope at that end has a stick 6 feet long with which he measures from peg to peg. The pegs are generally split up 18 inches long, 1 inch square, and cast from 37½c. to 50 cents per 1,000.

Holing or cutting holes in which to put the teak plants in is generally done with mamoties, the holes are cut about 15 inches deep, the circumference varies according to the man and is immaterial, a cooly can cut from 150 to 200 holes per diem, cost per acre is about Rs. 2 to Rs. 3.

Planting takes place as we have said from November to January, and the sooner it is done the better, as the plants will get little rain after January, and should be allowed time to establish themselves; besides, if the planting can be finished early, there is often time to go over the clearing again and supply vacancies.

The plants are best taken out of the nursery with a three pronged fork, this is passed into the ground as far as possible by the side of the bed, and levered up thus lifting the plants. Great care should be taken not to pull the plants, as the rootlets get easily broken, and if the soil is at all hard, it may be advisable to water it well the evening before one intends taking the plants out. Planting is best done in cloudy weather, just after or before rain, coolies will not take care to plant carefully if it is raining at all heavily, and if it is dry the plants are liable to droop before they get a hold of the soil.

When planting, it is most necessary that the plant should be held in its natural position in the hole, the roots should not be bent, and the plant should be put in so that the roots are all in the ground and the commencement of the stem just flush with the surface of the earth. Earth should then be carefully placed all round and over the roots, and then the planter holding the plant in one hand presses the earth down, and if necessary puts in more earth. It is essential that the earth round the plant should be of the same height as the surrounding ground, as otherwise if there is a hollow, the water often lodges in it and causes the plant to rot off. —*Ceylon Forester.*

Wood Pavement in Rangoon.

The Rangoon Municipality has experimented with 150 feet of wooden pavement in the busiest part of Merchant Street. The first cost has been heavy—Rs. 6,000 it is said—but the work has been substantially done and is expected to last fifteen years. If it lasts so

long, the wooden pavement will be a success and cheaper than stone. The wood used is *plyinkado*, or iron wood, which is cheaper than teak.—*Indian Engineering.*

The Dimensions of Trees.

We extract the following from Kerner and Oliver's "Natural History of Plants." Some of the certified dimensions are astounding and it would be interesting to learn further details in regard to these measurements. It seems incredible that a chestnut tree should attain a diameter of stem of 20 metres, about the length of a cricket pitch!

"The certified estimates of the heights of trees are of such general interest that they are included below in the following table:—"

Name.	Height in metres.
Peppermint tree (*Eucalyptus amygdalina*)	140–152
Mammoth tree (*Sequoia gigantea*)	79–142
Silver Fir (*Abies pectinata*)	75
Spruce Fir (*Abies excelsa*)	60
Larch (*Larix Europœa*)	53·7
Cypress (*Cupressus fastigiata*)	52
Scotch Pine (*Pinus sylvestris*)	48
Beech (*Fagus sylvatica*)	44
Cedar of Lebanon (*Cedrus Libani*)	40
Abele (*Populus alba*)	40
Mexican Cedar (*Taxodium mexicanum*)	38·7
Durmast (*Quercus sessiliflora*)	35
Plane (*Platanus orientalis*)	30
Ash (*Fraxinus excelsior*)	30
Baobab (*Adansonia digitata*)	23·1
Arolla Pine (*Pinus cembra*)	22·7
Tree of Heaven (*Ailanthus glandulosa*)	22
Oak (*Quercus pedunculata*)	20
Hornbeam (*Carpinus betulus*)	20
Yew (*Taxus baccata*)	15

"*Eucalyptus amygdalina* consequently attains the greatest height of all known trees. The highest of these stems placed beside St. Paul's Cathedral would tower about 40 metres above the cross and would be only 4 metres lower than Cologne Cathedral."

"That the height and girth of trees do not increase proportionately will be seen by comparing the following table with the previous one" ;—

Name.	Diameter of trunk in metres.
Chestnut (*Castanea vulgaris*)	20·
Mexican cedar (*Taxodium mexicanum*)	16·5
Plane (*Platanus orientalis*)	15·4
Deciduous Cypress (*Taxodium distichum*)	11·9
Mammoth tree (*Sequoia gigantea*)	11
Baobab (*Adansonia digitata*)	9·5
Broad-leaved Lime (*Tilia grandifolia*)	9
Peppermint tree (*Eucalyptus amygdalina*)	8
Oak (*Quercus pedunculata*)	7
Yew (*Taxus baccata*)	4·9
Oak (*Quercus sessiliflora*)	4·2
Cypress (*Cupressus fastigiata*)	3·2
Elm (*Ulmus campestris*)	3
Silver Fir (*Abies pectinata*)	3
Abele (*Populus alba*)	2·8
Beech (*Fagus sylvatica*)	2
Spruce Fir (*Abies excelsa*)	2
Arolla Pine (*Pinus cembra*)	1·7
Ash (*Fraxinus excelsa*)	1·7
Larch (*Larix Europœa*)	1·6
Cornel (*Cornus mas*)	1·4
Scotch Pine (*Pinus sylvestris*)	1
Hornbeam (*Carpinus betulus*)	1
Tree of Heaven (*Ailanthus glandulosa*)	0·9

According to these certified estimates there actually exist plants whose stems attain a diameter of 20 metres, and others whose stems rise to a height of 152 metres above the ground."

The Forest School Athletic Sports.

The annual sports were successfully brought off on the old parade ground at Dehra Dun on the 9th and 10th October, in the presence of a numerous assemblage, and produced some good performances. The first day was devoted to preliminary trials, in which the less proficient were weeded out. On the second day a

programme of ten events was gone through, with the following results :—

Flat race, 100 *yds.*, open to the whole School, native students. This was won in II 3/5 seconds by Laxman Singh, Bilimoria, a good second.

Long Jump, open to the whole School. Special prize for the best native student. Won by R. R. Fouracres, who covered 18 ft. 2 in. J. Brown was second with 18 ft. 1 in. which he might perhaps have bettered, had be not hurt his foot. Laxman Singh took the prize for natives with 14 ft. 3½ in.

Flat Race, 100 *yds.*, open to the whole School. This was won by Fouracres in 10 4/5 seconds. Matthews second.

Throwing the Cricket Ball, open to the whole School. This was won by R. R. Fouracres with a throw of 287 ft. 8 inches, but in the trial heats he had thrown 100 yds. Laxman Singh took the special prize for natives.

Hurdle Race, 120 *yds.*, *over* 10 *flights*, for native students. Won by P. R. Joshi in 21 3/5 seconds, with Laxman Singh second.

High Jump, open to the whole School. This was won by W. P. G. Cooper with 4 ft. 10 inches, but as he had not been extended he continued without a fault up to 5 ft. 4 inches, cleared neatly. Laxman Singh took the special prize for natives with 4ft. 6 inches.

Hurdle Race, 120 *yds.*, *over* 10 *flights*, open to the whole School. This was won by R. R. Fouracres, C. A. Clerk second, F. C. Purkis third.

Flat Race, 100 *yds*, for School and Forest servants. The three first were Hushyar Singh, Munir Khan, and Nathu Singh.

Tug of War, Seniors against Juniors. The pull was obstinately contested and gave rise to great excitement, some of the spectators evidently wishing to go in and help, but it terminated at last in favour of the Juniors.

The prizes were then distributed by Mrs. Osmaston with her usual kindly grace and the meeting broke up amid cheers.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

5th October, 1896.

EAST INDIA TEAK—The deliveries for the first three quarters of 1896 have amounted to 16,264 loads, as compared with 13,554 loads for the same period of 1895, and for September this year 2,481 loads against 2,123 loads in September 1895. There is no change to report since August, the general demand has been perhaps a little brisker, but it has not affected quotations.

ROSEWOOD, EAST INDIA—is saleable, in small lots, at good prices.

SATINWOOD, EAST INDIA—is of rather slow sale, and stocks are sufficient.

EBONY, EAST INDIA—small lots of good wood bring very fair prices.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton.	£6	to	£10
Satinwood	„ sup foot.	7d.	to	18d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, October, 1896.

Cardamoms		per lb.	1s. 1d.	to	2s. 8d.
Croton seeds		per cwt.	60s.	to	65s.
Cutch		„	17s.	to	32s. 6d.
Gum Arabic,		„	37s. 6d.	to	45s.
Gum Kino		„	£20	to	£25.
Indiarubber,	Assam	per lb.	1s. 10d.	to	2s. 3½d.
„	Burma	„	1s. 4d.	to	1s. 11½d
Myrabolams,	Madras	per cwt.	2s. 6d.	to	4s. 6d.
„	Jubbulpore	„	3s. 9d.	to	6s.
„	Bombay	„	3s. 9d.	to	7s.
„	Bengal	„	3s. 6d.	to	5s. 6d.
Nux Vomica,		„	6s.	to	7s. 6d.
Oil, Lemon Grass		per lb.	2½d.		
Orchella, Ceylon		per ton	11s.	to	15s.
Sandalwood, logs		„	£30	to	£50
„	chips	„	£4	to	£8
Sapanwood,		„	£4	to	£5
Seed lac		„	70s.	to	95s.
Tamarind,		per cwt.	6s.	to	9s.

Statement of average selling rates of timber and bamboos in Moradabad, Cawnpore, Pilibhit, Bulandshahr, Delhi, and Bareilly for the month of September 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10' Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sál and Sain, &c., Karis 12' × 5" × 4" { Sal ...	50 0 0	60 0 0			
{ Sain	30 0 0	40 0 0	...	...	
Sál bed posts, 7' × 2½" × 2½"	0 8 0	0 10 0	...	...	
Bamboos of 9' to 10' per 100 score	...	...	50 0 0	75 0 0	
CAWNPORE.					
Sál, 10' Tors (Poles) ...	4 8 0	5 4 0	...	...	
Sál and Sain, &c., Karis 12' × 5" × 4"	25 0 0	45 0 0	...	...	
Sál bed posts, 7' × 2½" × 2½"	10 0 0	12 8 0	...	...	
Bamboos of 9' to 10' per 100 score ...	...	...	30 0 0	50 0 0	
PILIBHIT.					
Sál, 10' Tors (Poles) ...	30 0 0	60 0 0	...	...	
Sál and Sain, &c., Karis 12" × 5' × 4" ...	25 0 0	35 0 0	..	...	
Sál bed posts, 7' × 2½" × 2½" ..	4 0 0	5 0 0	...	...	
Bamboos of 9' to 10' per 100 score ...	...	...	33 0 0	{ 80 0 0 / 400 0 0	
BULANDSHAHR.					
Sál 10' Tors (Poles) ...	12 0 0	13 0 0	...	...	
Sál and Sain, &c., Karis 12' × 5" × 4" Sain ...	33 0 0	33 0 0	...	...	
Sál bed posts, 7' × 2½" × 2½" ..	...	...	...	...	
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	60 0 0	
DELHI.					
Sál, 10' Tors (Poles) ...	5 0 0	10 0 0			
Sál and Sain, &c., Karis, 12' × 5" × 4" { Sal ...	{ 30 0 0	60 0 0	...	...	
{ Sain	{ 20 0 0	25 0 0	...	...	
Sál bed posts, 7' × 2½" × 2½" ...	8 0 0	9 0 0	...	...	
Bamboos of 9' to 10' per 100 score ...	...	...	20 0 0	75 0 0	
BAREILLY.					
Sál, 10' Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sál and Sain, &c., Karis, 12' × 5" × 4"	{ 25 0 0	{ 35 0 0	...	..	
	{ 40 0 0	{ 50 0 0	...	..	
		{ 60 0 0			
Sál bed posts, 7' × 2½" × 2½" ...	10 0 0	25 0 0			
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	137 0 0	

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For little-known Trees.

Specialism is a feature of the age, and is no doubt a necessary condition of further progress, but it has its drawbacks, among which may be reckoned a certain narrowness of view, combined with a child-like ignorance of the innumerable generalities that go to make up life outside the laboratory or workshop. We foresters even, though we worship Mother Earth, and pay our vows at the breezy shrines of the Dryads, are not entirely so free as we might be. Certain "Improvement" fellings we wot of, in which the operations prescribed reduce themselves principally to two, the attempted extermination of climbers, and the real extermination of every species of tree, except *Shorea robusta*, and a few stems of *Adina cordifolia*. No doubt this may be financially sound, though the supposition that it is so is only based on our ignorance of the future, and of the real needs both of sál and of the market. Granted the soundness of the financial position, it remains impossible to grant that, of the biological one, until proof is adduced that the sál grows markedly better in the pure, or, as Mr. Macgregor would say, the unmixed, state, than it can with any admixture. It would further be necessary to prove that the soil under pure sál loses nothing by the absence of other species. Similarly, it would be necessary to prove that some of these other species could not utilise certain elements of the soil which the sál could well spare. Probably no forester would undertake to prove these points; therefore, the ban upon all other species is simply based on the present relative prices of sál as compared with them. Sál is no doubt the most useful timber in many forests, and it is necessary to produce it in preponderating quantities. But man cannot live by bread alone, and *toujours sál* would eventually become as monotonous as *toujours perdrix*. There is a similar tendency becoming visible, in a less marked degree, in teak forests. It is not

as though there were no other timbers worthy to be cultivated, for there are many that would find ample scope for utility in their place and degree, if they were but properly studied and introduced to the market. Many of these timbers, *Dalbergias*, *Terminalias*, *Sandal*, *Kheir*, &c., &c., are already well known and largely used, but there are still others which would repay development. By way of introducing these to public notice, a few were sent to the Chicago Exhibition. On seeing the proposed list, certain authorities objected, saying that the commercial woods were teak, blackwood, &c., and that these were sporadic trees, more or less curiosities, which could not be supplied in any quantity, even if they were any good. The reply was, that the regular trade trees were already sufficiently represented, and that they did not require further pushing, as the quantities actually cut were already based too much on the demand, and too little on the good of the forests; further, that the urgent need of the forests, from a cultural point of view, was the utilisation of the lesser known trees, which either cumber the ground, embarrassing the treatment, or are wasted; finally, that if a demand arose, they could be supplied and in some quantity at present, and could easily be multiplied, to the great advantage of the forests and the trade alike. These views are perfectly sound, but the assertion as to the ease of cultivation was perhaps a little premature. Take, for instance, *Schrebera swieteni-oides*, a tree somewhat local in its distribution, but by no means rare. The wood is hard, of a warm pale purplish brown colour, prettily veined, though without silver-grain, and produces a fine smooth surface under the plane. It would be an excellent wood for chairs, tables, cabinet work, and such uses. But can any forester say that he knows its seedling? The time of fruiting is known, but information is desired as to the time of germination, the appearance when small, the wants, general behaviour, and subsequent career of the seedling. Brandis does not give the time of fruiting, but the barren seed falls about December, and the good seed somewhat later. The Forest School would be grateful to any one who would be so good as to send a supply of fertile seed for experiment. The Guzerathi name, which Brandis does not give, is *pōpti*, or more rarely *ghant*; *ghaut* is a misprint.

Take again *Elæodendron Roxburghii*. The wood is very similar in appearance to the last, but less hard and lighter in colour. It is very prettily veined, pleasant to work, and suitable for turning and for much the same purposes as the *Mokha*. The tree is more or less common from the sub-Himalaya to Kanara, but does not usually attain the dimensions of the former tree. Brandis gives April-May as the time of ripening of the fruit, as is no doubt often the case, but the barren or injured seeds will be found falling at the present date, and probably ripe seed can be obtained by February, perhaps earlier. The name given in Brandis for *Bombax* is *Tamruj*, which may possibly exist, in some part of the presidency, the common names, when any is obtainable, are

Alan in the Guzerat side, and *Bhutkes*, *Bhuteakalas*, *Bhutuksha*, &c., in the Mahratta country. Ripe seed of this tree would also be thankfully received at the Forest School. Here, again, can any forester say he knows the seedling, its times and conditions of coming and going. If so, the *Forester* shall open its pages wide to welcome him in.

A third tree worth propagating is the *Hadang* of Kanara, *Eriolæna Candollei*, found also in Burma. The wood is of a walnut brown, but not so dark, sometimes with reddish veins and dark streaks, it cuts and works with the same ease, and shows an extremely pretty silver-grain. It would be suitable for fine cabinet work, picture frames, or, indeed, any coarser uses, for it is said in Mr. Talbot's book to be largely used for making carts. At the same time, few foresters probably know anything about its seeding and life history.

The above are only three trees, to begin with, belonging to the upper storey, for the same considerations affect also the lower storey and undergrowth. But first, to finish with the former, it may be noted that there are trees, to use a paradox, whose very worthlessness constitutes their value. *Bombax*, *Sterculia*, *Spondias*, &c., for instance. Any bunnia can see that teak and sál fetch a higher price at present than anything else, but it is the trained forester's duty to look ahead, and not to exterminate trees that may ere long have a much greater value. Now these apparently useless trees have a vocation beyond that of merely helping to constitute a mixture, namely, the paper industry. It cannot be supposed that this country will always be content to import foreign paper. On the contrary, we must expect that in the possibly near future, every locality will want its own paper mill, working up the produce of its own forests, and thereby saving the great cost of long transport. It is true that the utility of these trees for this purpose has not yet been ascertained, but that is mere negative knowledge, or rather no knowledge at all, for the probability of such a utility arising is sufficiently great to render unjustifiable any attempt to exterminate them.

As regards the underwood, the same considerations hold good. Up to the present, little or no attention has been bestowed on this category, but something might perhaps be done towards selective treatment. The lower storey often contains a mass of species that can never have any great utility, even as firewood; for instance, *Ehretia lævis*, *Holarrhena*, (in some books, perhaps, through confusion with *Wrightea*, fancifully compared with box) and many such. On the other hand, there are many small tress and even shrubs that produce a timber of value. *Wrightea tinctoria* is not bad, and might be a good enough substitute for box to suit native newspapers, but there is a shrub which gives something much more like the real article, namely, *Gardenia lucida* and *turgida*, whose wood is sometimes almost indistinguishable from it. *Randia dumetorum*, *Mallotus*, and a score of others are also worth prefer-

ential treatment, if any method of exercising it can be found. In short, there is an important branch of forestry to be developed, and it is the object of this article to point out a road by which working foresters may render services of the greatest value.

II.—CORRESPONDENCE.

The New Edition of D'Arcy's Working Plans.

The September *Forester* contains an interesting criticism of the above, by Mr. Macgregor, with whom I cannot, however, on all points agree. Firstly, some of the definitions are discussed. The word "*canopy*" I like. "*Cover*" refers partly to the crowns of the trees, but principally to the projection thereof. "*Canopy*" *can* only mean the leafy crowns, and, therefore, has a certain utility. "*Pure*," again, I approve of. True, it is the opposite of impure, but that does not exclude every other meaning, and I think it can be equally well used as the opposite of mixed, and is indeed frequently so used in ordinary language. "*Density*" also applies quite as much to the shade as to the number of stems. The shade may be more or less dense, whether the area be completely stocked or not. "*High forest*," too, is a very convenient term, if used as it should be, to indicate a seedling forest which has passed the pole stage. With regard to "*storeyed forest*," no better term can be found. The forest does grow in that way, and the storeys, or age-classes can be more or less recognised by the eye. It presents points of vital difference from selection forest, is not so complicated as it looks, and in my opinion is a method which ought to be largely applied in India, in the place of the coppice with standards to which we are all slaves. I never heard of it as anybody's method, and do not know who invented it, or how old it is. When I was at Nancy, it was regularly taught as one of the established methods twenty years ago, and apparently long before that. In fact, I expect it is more or less contemporary with the old French *maîtrise*. I agree with Mr. Macgregor in objecting to speak of a preparatory *or* seed-felling as the same thing. The proposed term "*cutting cycle*," or "*felling cycle*," is much preferable to "*cutting roation*," and I shall adopt it for my own use in future, with thanks. There is a great deal of disorder in the use of the terms "*block*" and "*working circle*." If we are to confine "*block*" to areas showing differences of soil, growth, &c., then the working circle becomes our unit, and can only have one principal felling per year, but if the working circle is to include one or more talukas, then we must have block, or some new term, to indicate each forest in it being worked without reference to the others, though all may

be worked on precisely the same plan. But I have little esteem for the present make-shift fashion of knocking half a dozen talukas into one working circle, carving out a lot of blocks, or whatever we are to call them, and working them all on the same stereotyped plan, as though they were all alike, and with an exclusive eye to the nearest village. I agree with Mr. Macgregor that "*stock-taking*" is preferable to "*valuation*," when the operation does not embrace values. But as regards "*type-trees*" and "*form-factors*," I prefer the old terms. A "*type-tree*" is a tree typical of its class, in word and in fact; a "*test-tree*" may be anything; "*factor*" I consider quite as good English as co-efficient, and a good deal shorter.

We now come to the crux of my letter, for the above is all trivial. Mr. Macgregor is a leader of the financial school, he will look at nothing but the rate per cent., and calls it "*rational*" organisation. His new Kanara working-plan provides, and will proceed to cut out at once, in addition to the normal yield, a large class of trees styled "over-mature." I believe I am not misrepresenting him in saying that, if the extraction is possible, there will not be left a teak tree of over two feet diameter in the whole of Kanara. But if there ever was a country destined to grow large teak and other trees, that country is Kanara. Needless to say, I am one of the economic school, heartily deprecating this Jew-Bunnia policy in State forests. It is all very well for private persons, who are fain to defile their hands with "customs of the trade," and their souls with "commercial morality," on the pretext of making both ends meet. This "commercial morality" or rascality, according to the circles one frequents, has for its one great cause and justification the rate per cent. The rate per cent. is a consideration which, *as a prime motive*, ought to be tabooed by every respectable state. If our forests are to be worked on financial, or commercial principles, where is the need for the state to trouble itself, and earn unpopularity for the government of the day, by so doing. Why not hand them over bodily to the commercial classes, rich landholders and needy municipalities, and the nearest villages, which would manage them on most thoroughly commercial and financial of principles. Mr. Macgregor's reply would probably be that these people would cut them down too speedily, which is precisely what some of us think is likely to be the case under the new Kanara working-plan. This "rational" financial organisation is only one degree better than leaving forest production to the tender mercies of the timber trade and land-speculating classes.

If the State grew forest as a speculation, there would be much to say in favour of Mr. Macgregor's policy; if as an investment, still something. But I take it the position of the State or rather of the government which acts, is that of trustee for an estate which is already invested in forests. It has no right to

diminish either the quantity or quality of the forest in its charge, unless it is first clearly proved (not merely opined by one possible faddist) that the interest of the State requires the proposed course. This being my view, I am bound to hold, while accepting frankly a humble position at the feet of Mr. Macgregor, that he has no right to reduce the size of the trees, and the value of the stock, and, therefore, of the property, by making an alleged over-mature class, which is really only over-mature when judged by his own financial standard. It may seem bigoted—I am bigoted in some things—and it appears to me that in the matter of State forests, there is really only one argument worth consideration, and before it all others must hide their insignificant heads. This one ruling factor of the problem is, that large timber is an absolute necessity, and if the State does not grow it nobody else will ; private landowners cannot afford to do so. There remains the only alternative of importation which has served us right well, so far, but cannot long continue. Already Norway, Sweden. and the accessible parts of Russia are cleaned out. Already patriotic associations, or governments, are taking steps for the preservation of what remains, *for themselves*. The only recourse for the determined financier is thus to deny that the largest timber is really the most useful, and this, I gather, is Mr. Macgregor's position. But if we admit, as I claim we must, the absolute necessity of large timber, we can afford to ignore all comparisons between lesser degrees of utility. Even if we admit, with Mr. Macgregor, that the present demand is principally for small stuff, we have no right to assume that it will always be so. All the world over, primitive man, like the masses in this country, has required small stuff, and could not use large. All the world over, as man became civilised, he developed a pressing need for large stuff, and is actually in coming danger of having to do without it. Reasonable foresight requires us to assume that the future demand will be for large stuff We are also entitled to assume that facilities for extraction will largely increase. If the State owed no duty to its citizens, it might be allowable for governments to juggle with the rate per cent. and to turn over its money as fast as possible, reinvesting the profits other ways, since, *ex hypothesis*, it could not invest them in improving its forest estate. But, as I have already said, the State has an imperative duty, namely, to provide its citizens with that which they cannot provide for themselves, a sufficient area of forest in proportion to the population, and a sufficient supply of timber of the largest class. In view of the large importations of Burma teak, it can certainly not be said that the latter condition is fulfilled, or likely to be, under the new working plan.

It should be clearly understood that I am not denying the existence of over-mature trees in Kanara; no doubt, there are a good number in the more difficult parts. Whether the really overmature and decaying trees are those that will be extracted is a

question. But what I radically object to is, a basis of calculation that makes a tree mature at two feet diameter. And what I object to still more is, the cutting of the whole surplus, which I do not admit to be a legitimate surplus, within a period of a dozen or a score of years, over and above the regular yield. It would surely have been more careful stewardship to have spread the surplus, whatever it may be, over a longer period.

To return to the finance, what is the rate per cent.? It is a convention of such a nature that there may be two forests of equal extent and fertility, one may yield only 2% or less on its capital value, the other 4%. At the same time, the owner of the former may get from his forest a yearly income twice as large as the owner of the latter does from his, which nevertheless is producing a higher rate of interest. The secret of the apparent anomaly, as we all know, is in the age of exploitability and consequent stock on the ground. Mr. Macgregor considers that the *summum bonum* is the "highest prospective land value." Perhaps it is, for the private individual who can take the profits of his forest and place them out at 6 or 8%, taking the commercial risks consequent on that proceeding. But the responsibility of a government does not include any such risks, nor even those of ordinary agricultural investments. What the State wants is the largest net revenue, the biggest lump sum obtainable year by year from its forests, not from its forests and some other speculation combined, quite irrespective of questions of the rate per cent. or prospective land values. This, I have already shown, coincides with its duty to its citizens at large. The largest net revenue follows the heaviest stock on the ground, limited by the age of incipient general unsoundness. Now the Kanara forests contain numbers of trees larger than Mr. Macgregor's exploitable size, and not yet unsound. If I made a working-plan for Kanara, the top class would probably include the largest existing trees sound and unsound, only exceptional trees being considered over-mature. Mr. Macgregor not only makes a large over-mature class, but proceeds to cut it all out in the shortest possible time, in addition to the normal yield. This looks too much like a hand-to-mouth policy, designed to give a large revenue during our time, but likely to leave our successors in a much less favourable position.

I have not had the opportunity of studying the new Kanara working-plan, and am therefore perhaps open to telling retorts from Mr. Macgregor, which I must take as they come; but if Mr. Macgregor would give us the full plan, and its progressive history in these pages, he would, I am sure, produce a most interesting document, and would give great pleasure to all who take delight in their profession.

F. GLEADOW.

Kranji.

In the paper—*Indian Forester*, October 1896—on "*Timbers in the Straits Settlements*," by Mr. Henry J. Child, presented to the Association of Surveyors of H. M. Service, supplement to Foreign Station paper on Singapore and said to be "based upon practical 'experience and from frequent visits to the timber ponds and saw-'mills about Singapore, as well as information obtained from 'reliable sources during five years residence at this station," reference is made to *kranji* as "a large tree growing to a height 'of 60 feet with a diameter of 4 feet, but is very uncommon in 'forests. The timber, which is of a dark colour and fine-veined, is 'very hard and durable."

In his list of *Timbers in general use, Singapore*, Mr. Child gives the scientific name of *kranji* as *Dialium indicum*. There is no such species, but perhaps *D. indum* is intended.*

D. indum has been longer known than any Asiatic species of the genus. It was first made known to Europeans by Bontius, *Hist. Ind. Or.* p. 93, under the name *Carandje*, and it has been usual to assign to it in particular the Malay name *kranji*. It would appear, however, that the name *kranji* is generic in its significance and is applied to most, if not to all, the Malayan species of *Dialium*. For, while, according to Bontius, to Rumphius, and more recently, to Miquel and to Koorders and Valeton the name indicates only *D. indum*, field notes by Malayan botanists and collectors, on specimens in the Calcutta Herbarium, show that it may be applied to *D. laurinum* (Ridley 6437) to a form of *D. platysepalum* (Holmberg 221), to *D. Maingayi* (Curtis 440), and to what appears to be a form of *D. ambiguum* from Malacca (Derry 510 collected in 1892).†

According to Mr. Baker (*Flor. Brit. Ind.* II. 269) *D. indum* was not known from the Malay Peninsula up to July 1878. It has, however, since then been reported from Pahang by Mr. Ridley and from Penang by Mr. Curtis. There is no means of deciding from Mr. Ridley's field notes or from the references to the genus in his paper on the *Flora of the Eastern Coast of the Malay Peninsula* (*Trans. Linn. Soc.* n. s. Vol. III) whether *D. indum* is 'wild' in Pahang, but Mr. Ridley's silence on the point perhaps indicates that the tree may be indigenous there. With the Penang habitat it is otherwise, for Mr. Curtis' notes the specimens as being from "Ayer Etam in Miller's compound" and

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* *Indum* was meant. We regret the mistake.—*Hony. Ed.*

† There is another "510" collected by Derry in 1890, which is not the same; it is undoubtedly a form of *D. platysepalum*, but it bears the name *serpan*, not *kranji*. This affords an excellent example of undesirability of collectors, no matter how thoroughly acquainted with a flora they may be, giving the same number to two different gatherings.

has a doubt as to the precise name of the tree; this he gives as *Kranji burong* or *Kranji padie*. Both the situation of the tree and the dubiety as to its Malay name seem to indicate that it is a stranger in Penang. The name *Kranji padie* does not occur on any other specimen at Calcutta, but the name *Kranji burong* accompanies a form of *D. platysepalum* (Holmberg 855) from Malacca, characterised by having clavate instead of orbicular pods. Another specimen, for which alternative names are given, is an example of *D. Maingayi* (Goodenough 1533) from Malacca which is cited as being *Kranji ambot* or *Kranji s'kellat*. No other specimen bears the name *Kranji ambot*, but the name *Kranji s'kellat* is used twice (Derry 88; Goodenough 1693) for specimens, from Malacca, of the form of *D. platysepalum* with globose fruits. Still another name, *Kranji papan*, is used (Goodenough 1321) for a specimen of *D. laurinum*, but this name is used on two other occasions by the same collector (Goodenough 1225; 1553) for a very different plant,—the form of *D. platysepalum* with orbicular but distinctly compressed, not spherical pods.

There are several other species of *Dialium* in the Malay Peninsula, (*D. patens, D. Kunstleri, D. Wallichii, D. Kingii*) for which no native name has so far been reported, but as all have the same kind of fruit, and as it is with the fruit that the Malay associates most of his ideas of *kranji*, there is little reason to doubt that any of them may bear the name, with or without some added epithet.

The point, however, that it is wished to insist on, is that the *kranji* of Mr. Child's paper may fairly well be any one of *nine* different trees, though with every probability of its *not* being the species that he supposes it to be.

Malay names are apparently quite as vague and unreliable in their incidence as Indian names can possibly be, and the present case affords an excellent instance of the risk that is run when reliance is placed upon them. And there is no certainty that the identity of the other timbers enumerated by Mr. Child is less obscure than the identity of his *kranji*.

D. PRAIN.

A Legal Question.

Perhaps some of the readers of the *Indian Forester* will be good enough to give me an answer to the questions at the end of the following :—

A Government contractor has a contract to work timber from a certain forest, a portion of which is drained by a stream, in which floating operations are impossible above a certain point, the only practicable alternative being carting. He finds, however, that :—

(1) Across the only track, along which carting is possible, a *taungya* has been cut and planted ; and

(2) between the point at which the carting track leaves the forest proper, and the stream there is a stretch of paddy fields (State land) which are cultivated at irregular intervals, depending upon the rainfall.

Under Rule 49 (1) of the rules under the Upper Burma Forest Regulation, timber may be transported across any land under the authority of the Deputy Commissioner or Divisional Forest Officer. Under clause (2) of the same rule, however, 'if any damage is done to private property by the transport of 'such timber, such compensation as the Deputy Commissioner 'may adjudge to be reasonable, shall be paid therefor."

The contractor claims that according to his contract he is granted "full and free right of ingress, egress, regress, passage and way into and from" the forest in question, and that, therefore, he cannot be called upon to pay the compensation, which should be paid by Government.

The questions to which I want replies are—

(1) In the event of timber being carted across the lands referred to, can any compensation be legally claimed, at all, by the cultivator of (*a*) the *taungya*, (*b*) the paddy fields? and, if so

(2) From whom should the compensation be claimed ?

I hope I have succeeded in stating the case clearly, but the following notes may be of assistance :—

1. Special permission had not been obtained to make the *taungya*.
2. The rotation under which it was worked was irregular.
3. The right to cultivate the paddy fields would probably be allowed.

H. H. F.

We should say that the cultivators are bound to leave a right of way open to the forest, and have no claim for compensation.—Hon. Ed.

Bassia latifolia.

I send by this post some flowers of *Mahwa* (*Bassia latifolia*) which were gathered by Mr. Mansukh Rai at Lohara in the Wun District (Berar) at the end of October 1896.

Mahwa usually flowers in March-April, and the present early flowering can only be attributed to the early cessation of the rains.

Mr. Mansukh Rai will be glad to hear if early flowering of the *Mahwa* has been observed elsewhere.

C. BAGSHAWE.

IV.—REVIEWS.

Forest Administration in Jodhpur in 1895-6.

The Forest Administration Report of Jodhpur for the year 1895-96 shews that steady progress continues to be made in this State. No addition was made to the area of forest (294 sq. miles), but proposals for its extension were under the consideration of the Durbar. The record of rights in the Raepur forests was completed and published, and a similar record is being prepared for the Ghanerao forest.

Forest offiences were fewer than in the previous year, and fire protection was very successful, only 437 acres being burnt out of 174,720 acres, and if it had not been for carelessness on the part of the neighbouring State, the results would have been still better. The year was an unfavourable one for natural reproduction, but seedlings of *Khair* (*Acacia catechu*) are said to have come up freely in places where there was sufficient grass to protect them from frost.

Owing to the partial failure of the rains a larger number of cattle than usual were admitted in the forests, but all forests were closed from the 1st August to the 10th October, and sheep and goats were altogether excluded.

The total revenue of the year was Rs. 22,084 and the expenditure Rs. 17,165, leaving a surplus of Rs. 4,919. In addition to this forest produce, on which revenue to the amount of Rs. 15,000 would otherwise have been due, was given away either free of charge or at reduced rates.

VI—EXTRACTS, NOTES & QUERIES.

Chestnut and Robinia as Forest Trees.

The September number of the "*Allgemeine Forst and Jagd Zeitung*" contains an interesting article on the chestnut, *Castanea vulgaris*, and the robinia, *Robinia pseudacacia*, in Upper Elsass; and as the cultivation of both these trees is of considerable practical interest for all forest officers in India, (at least in the more northern provinces) we would draw their attention to this paper. As yet the chestnut has been cultivated in India (in the Punjab and North-West Provinces) only with a view to its fruit production, but the tree is of even greater importance as a timber tree, more especially for the production of small poles, and it yields at the same time excellent firewood.

Both in Upper and Lower Elsass the chestnut is found intermixed in high timber forests, and yields excellent scantling, but it is chiefly cultivated in coppice forests with a rotation of from 14 to 16 years. It is under this treatment that the tree yields its most excellent results, and produces poles 20 to 24

inches in circumference, measured above the swell at the bottom, and 36 feet long. The wood, moreover, is of excellent quality, and as the sapwood resists exposure to a much greater extent than that of the oak it is mostly used in Upper Elsass as vine props. Chestnut poles left standing all winter in the ground will last 25 years without being changed or moved, and remain useful when left thus for another ten years with an occasional re-pointing. Owing to the enormous yield per acre, and their lasting qualities, poles of chestnut, and to a less extent robinia, alone among timbers, can hold their own against cheap impregnated fir poles.

As regards habits and cultivation, the following notes, culled from Mr. Hallbauer's paper, may prove instructive. Both the chestnut and robinia favour a loose soil, especially the latter species, which refuses entirely to grow on a binding or hard soil. On the other hand, the robinia is much less exacting as regards depth or richness of the soil, owing to its immense system of surface roots. Both trees require a fairly well drained soil, the robinia even more so than the chestnut, and though they will grow in moist localities, especially on loose soil, they begin under these conditions to develop heart-rot at an early age.

As regards cultivation, the trees are very similar, and the best results have been obtained by planting one-year old plants on lands which had been ploughed and cultivated for two or three years. Both trees grow extremely rapidly, and reach maturity at the early age of between 12 and 16 years. It is for this reason essential that, when they are intended to be treated as coppice, the seedling plants should be cut down to the stock at an age of between 6 to 8 years. It is evident that the first crop will, under such circumstances, give a comparatively small yield of material useful only for firewood, but this initial loss will be amply repaid by the more rapid and denser growth of the future coppice crops.

The chestnut is a shade-enduring plant, as its struggle for existence is both intense and prolonged; early thinnings, even of coppice, are therefore advisable. The robinia, on the other hand, is light-loving, and no interference with its struggle for dominance is called for. The chestnut forms humus rapidly, and is a great soil-improver. The robinia, also, in spite of its light foliage, tends to improve the soil, though of course not to the same extent as the chestnut. Its leaves, however, decompose rapidly, and form a good natural manure, which favours the growth of tender grasses. It would for these reasons probably form an excellent standard in tea gardens or on grass farms. Standards of chestnut, even in localities where they do not yield large fruit, are of considerable value, as the wood is specially prized by carriage builders.

The coppice production of both the chestnut and the robinia is, in suitable localities, larger than that of any other species cultivated in Europe, and their experimental cultivation in India would seem to indicate that similar results may be achieved in this country.

The Dimensions of Trees.

In our last issue we called attention to some trees of extraordinary dimensions recorded in Kerner and Oliver's *Natural History of Plants*, we now add some notes of measurements of large trees of Indian species which may be of interest.

Cedrus Deodara. A section of a Deodar tree from the Jaunsar forest in the Forest School museum measures 27 feet in girth and shows 665 annual rings.

Cupressus torulosa.—Brandis' Forest flora mentions a cyprus tree measured by Dr. Steward which was 27 feet in girth near the ground.

Tectona grandis.—Teak trees of enormous size are not infrequent in Upper Burma. A felled log in the Yamèthin forest measured by S. Carr was 64 feet long and 13 feet 9 inches in mean girth; it was perfectly sound, and, when found, was in process of being split up to build a Buddhist monastery. In the Myittha—Panlaung forest there are two immense teak trees standing side by side, the largest of which was found by H. Calthrop to be 20 feet in girth at 6 feet from the ground with a height of 60 ft. to the first branch; and at Alaungdaw-Kathaba in the Chindwin a tree measured by C. E. Muriel girthed 17 feet 4 inches at 5 feet from the ground.

Bombax Malabaricum.—We have a photograph of a tree said to be 87½ feet in girth one foot from the ground, but it is believed that the measurement was taken along the contour of the buttresses.

Santalum album.—As a record measurement of a tree of the smaller classes may be mentioned a sandal tree felled by A. E. Lowrie in Coorg which measured 5 feet 6 inches at 5 feet from the ground.

Reforesting Waste Lands in Holland.

There is a society in Holland called the Nederlandische Heide Maatschapij, with objects similar to those of the New Jersey Forestry Association, with an official bi-monthly organ. It is encouraging to those interested in similar societies in America to know that the Heide Maatschapij and the similar society in Denmark, after which it was modelled, have been successful in many respects. It is also gratifying to learn that even in Europe a great deal of what has been accomplished is due to societies similar to the State associations of the United States. The objects of the Holland society are to promote the exploitation of the dunes, heaths and other desert places, to give advice, form nurseries, and sell trees at cost price, to educate the people in the principles of forestry by distributing literature and by delivering lectures and

to encourage the Government to improve the waste land which it owns. It has a membership of two thousand. Every member pays two gulden annually, but there are many honorary members and patrons who pay much larger sums for its support. This association has already accomplished a great deal. It has induced the Government to continue the work of foresting the dunes, for which twenty thousand gulden have been already appropriated for experimental purposes, and the work is under the direction of the society, and two nurseries have been formed in which many seedlings for dune planting are grown. This association has induced individuals to improve their waste lands, and contemplates buying and improving heath land for example' sake. The society is under the directorship of Mr. H. J. Lovink, an able and enthusiastic forester.

The Dutch dunes are similar to those of New Jersey, and unless the soil is covered it is shifted by wind and wave. More than four thousand acres of land in the neighbourhood of the town of Bergen is owned by the Government. This is very much like the dune land near Avalon, on the Jersey shore. There are residences surrounded by large trees in the lee of Dutch dunes, but everything has been planted, even the famous forest between the Hague and Scheveningen, the Atlantic City of Holland, and it will cost the Government at least two hundred thousand gulden to plant its dune lands in forest. Many private holders in this region are not in favor of this work, some preferring to see it in its unproductive state, mainly for hunting purposes.

The principal game, however, is rabbits, and their extermination has been decreed because they are very destructive. Thirty years ago experiments were begun by the famous geologist Staring for the planting of the dunes, but the work was frowned upon and discontinued ; the trees which he planted still remain.

In the eastern and southern parts of Holland there are vast stretches of rolling heath lands, a continuation of the Luneberger Heide in Hanover, which stretches through Schleswig-Holstein and Denmark to near the Zuyder Zee, in Holland. The soil is sand and gravel, mainly glacial drift, in which may be seen irregular ice-worn pieces of rock from the Scandinavian Peninsula. There are reasons for believing that at one time this region was in part forested. The names of places in old Dutch often mean forest or wood, and Mr. J. H. Schober, the pioneer of heath-planting in Holland, found part of the trunk of a large oak buried deep in the ground in his plantation at Schovenhorst A few sheep can live upon the scanty herbage, and as soon as a little humus forms on the surface it is removed by the peasants to mix with manure The beating force of winds and rains has compacted and leached the surface soil. Low heather and crisp lichens cover the ground, reminding one of the sterile fields in Southern New Jersey. It is even more barren than the fire-swept plains of Ocean County, in that State. With work, this whole

heath can be reclaimed. The huge experiment which Mr. Schober has had the patience and patriotism to begin proves that trees will grow there. A careful working and a little enrichment of the soil are all that are needed at first. When Mr. Schober began his plantation at Putten forty years ago it was all a desert heath Conifers from all parts of the world are growing there luxuriantly, and, although his experiments will not be complete for years to come, they show, at least, that a great variety of conifers will grow on the heath-lands of Holland, and that certain species are, of course, much better adapted to the soil and climate than others. Many tests must be made before conclusions as to the very best varieties are warranted. Mr. Schober has planted also large quantities of Scotch Pine, from which he receives a revenue. This wood is cut and carefully sorted, and the poles are shipped to the Belgian mines. What surprised me most on this remarkable plantation was to see species from the Rocky Mountains and the Atlas Mountains thriving in these heath-lands. The most beautiful trees in this large pinetum, as I saw them, were *Abies nobilis* and *Cedrus Atlantica*.

A great deal of private planting has been done in Holland with very little encouragement from the Government. In the southern part there are large areas in Scotch Pine and coppiceO ak. The Willow has been planted in immense quantities along the Lek, the Rhine, the Maas and Waal. In the sandy heath regions much of the soil has been improved by planting one of the Lupines, *Lupinus luteus*, a beautiful plant which may be useful in America as a green manure, since it seems to flourish on very sandy soil. The American Locust, *Robinia pseudacacia*, is a favorite tree here, since it grows well on poor soils, and it is quite the custom to plant it along railroad embankments. It is also a favourite shade-tree in many German cities, and, when properly trimmed, it has few equals for the purpose. Our Wild Cherry, *Prunus serotina*, also seems to thrive on the heath-lands.

Amsterdam, Holland. JOHN GIFFORD.

—*Forest and Garden.*

Recent Advances in Agricultural Chemistry.

In 1886 and 1888 there were published the important discoveries made by Hellriegel, Willfarth, and Beyerink, that the power of fixing the free nitrogen of the air, which leguminous plants possess, was, firstly, connected with the presence of certain small nodules growing on their roots, and, secondly, was caused by special bacteria growing in these nodules. Since then, rapid strides have been made towards the utilisation of these facts. By the labours of Dr. Nobbe and those associated with him, pure

cultivations of these bacteria, for purposes of inoculation, are now sold as an article of commerce under the name nitragin. In consideration of the value of this work, the Royal Agricultural Society lately directed Dr. Voelcker to proceed to Germany and investigate its progress. The information so gathered is to be found in detail in the Society's *Quarterly Journal*. It occurred to Dr. Nobbe that amongst the mass of bacteria growing in the nodules on any given plant, certain of them might be specially suited for the growth of that plant. He therefore endeavoured to isolate, by a process of pure cultivations, the supposed specific bacterium for different leguminous plants; and although no microscopic differences can be detected between the growths which he has thus sorted out from each other, a great diversity of action is exhibited when they are practically tested.

Thus it is found that each special cultivation is extremely potent with the species of leguminous plants from which it was originally obtained, and somewhat less active when used to inoculate closely-allied species; but quite without effect upon distant members of the order. There have also been isolated neutral bacteria, which have a greater or less effect on all the members of the leguminous order. These, moreover, after growing on the roots of any given species, become so modified that they lose their general activity and assume a special one. As a result of this scientific work, no less than seventeen varieties of the organism suitable for as many leguminous field-crops are now sold by a German firm at the price of half-a-crown a bottle, which quantity is sufficient to inoculate half-an-acre of land. The process of inoculation, however, has not been equally successful in all kinds of soil, and in one case of failure the active cause was supposed to be lime, as the treatment of a marl-treated plot has been successful. To discover whether this was indeed the true reason, comparative experiments on a small scale were made on both sandy and peaty soils with lime and marl, respectively, as manures ( ). The result of these pot experiments showed that the presence of lime, instead of being injurious to the bacteria nodules, was a considerable aid to their development, and, in the case of peaty soils, was really necessary, so that the field-results which suggested the experiments are still unexplained.

Other workers (2) have shown that a calcareous soil is advantageous for the growth of pine trees, the most conspicuous effect produced by a deficiency of lime being the production of short needles. If, however, magnesia is present with the lime, it acts injuriously, unless the relative proportion is very small. This last fact has been amplified by other experiments (3); these show that it is only the chloride of magnesium which is injurious, the other and less soluble salts being probably innocuous in the pre-

(1) Take, *Mitt. Ver. Förd. Moorkultur, 1895, 13.*
(2) Loew & Honda, *Bull. Coll. Agric. Imp. Univ. Tokyo, 1896, 2.*
(3) Larbalétrier & Malpeaux, *Ann. Agron. 1896, 22.*

sence of lime.

The latter is also of great use as a manure for tobacco, when grown on soils poor in this ingredient. The combustibility is thereby considerably increased, potash not being so useful for this purpose as was supposed (4).

The disappearance of nitrates from soils is a matter of considerable importance, and has met with some attention. It has been found that certain kinds of manure, if used together, caused a great loss of nitrogen (5), and this was attributed to denitrification by ferments. In 1890 the presence of such denitrifying agents in straw and other vegetable substance was demonstrated (6), and it is now experimentally proved that soil when watered with a preparation of these germs rapidly loses nitrogen. A similar result can be produced by consolidating the ground so as to check æration (7).

The influence of various chemical reagents on germination has been studied. An elaborate paper on this subject has been published, containing the results of 275 experiments arranged in 17 series (8). The more important conclusions may be summarised as follows: — Mineral and organic acids are injurious to germination, and strongly acid salts are more injurious than neutral salts. Free bases and strongly basic salts are poisonous. Salts, generally, are either injurious or without effect. Fats and ethereal oils prevent the germination of corn, and much retard peas and rape. Anæsthetics and hydro-carbons, generally, retard germination, while their vapours kill the seeds. Organic antiseptics are all injurious in solutions of more than 0·1 per cent., and coal-tar dyes also in solutions of 0·05 per cent. The influence of the various constituents of artificial manures in solutions of 0·05 to 0·5 per cent. has been examined (9). It is found that they are injurious to germination, but grains are more resistant than other seeds to their action. Lime water and basic phosphates, however, are very beneficial, especially to leguminous seeds. Sulphuric acid, even in very dilute solutions, is highly injurious, and as a considerable quantity (·108 to 1·612 per cent. by weight) is produced in the germination of seeds, it seems evident that it is the power which lime possesses of combining with, and neutralising, this acid that is the secret of its value.

(4) Cserhati, *J. Landw.*, *1895*, *43*.
(5) Wagner, *Journ. Agric. Prak*, *1895*.
(6) Bréal, *Ann. Agron. 1892*.
(7) Bréal, *Ann. Agron. 1896*.
(8) Sigmund, *Landw. Versuchs. Stat.*, *1896*, *47*.
(9) Claudel, & Crochetelle, *Ann. Agron.*, *1896*, *22*.

Imperial Institute Journal.

The inquiry by Dr. Nobbe took three distinct lines :—

1. What the nature of the process was by which leguminous nodule-possessing plants were enabled to assimilate free atmospheric nitrogen.

2. How the working of the nodules manifested itself in soils of different degrees of richness in nitrogen.
3. Whether the bacteria originating from the nodules of different kinds of leguminous plants were all of one and the same kind, or if each group of leguminous plants had its particular nodule activity.

As to 1, Nobbe concluded that, like the green plant, the bacteria could not by themselves assimilate free nitrogen, but that they were gradually changed in the nodules to a particular form known as "bacteroids," and that it was by virtue of their network arrangement in the cell of the nodules, which presented the largest possible surface to the air that they were enabled to absorb the free nitrogen of the cell sap and render it assimilable by the plant.

In regard to the second point, Nobbe found that the working of the nodules attains its full efficiency only when the soluble soil nitrogen was nearly used up. Accordingly, the more nitrogen that the soil contained capable for being taken up by the plant, the less was the difference between plants that had been inoculated and those that had not. As a consequence of this, quickly growing leguminous plants, such as peas, vetches, and the like, that used up the nitrogen of the soil quickly, showed the influence of the inoculation much more rapidly than did clover, lathyrus, &c. In the end, however, the inoculated plants possessed an advantage in that the demands of leguminous plants for nitrogenous food are exceptionally high.

The third question is the one of most importance to us at the present time. Nobbe showed, by his experiments, that though the bacteria from the nodules of leguminous plants of different families were in outward appearace scarcely to be distinguished from one another, yet in their behaviour to plants they showed very marked differences. The bacteria from nodules of the pea, for instance, acted admirably when used for inoculating the pea plant, and also did somewhat less well when used for vetches (which are nearly related to the pea), but they did not do at all when used on clover, serradella, robinia, &c.

Similarly, bacteria from the nodules of red clover, robinia, &c. would answer with those kinds of plants from which they originated, but had no action whatever on peas. From this, Nobbe drew the conclusion that every leguminous plant is most influenced by bacteria of its own kind, though bacteria of nearly related kinds can replace one another to a certain extent, but that bacteria from leguminous plants belonging to families widely separated from one another, either form no nodules at all, or only small ones with no appreciable influence on the supply of nitrogenous nourishment.

No absolute distinction, however, could be drawn respecting the activity possessed of the bacteria of nodules of different families of leguminous plants. For it was one only of degree. Pure

cultivations of unlike origin represented not special kinds, but only adoptable forms; these were able in a weaker degree to enter into symbiosis with all the families; these were the *neutral* bacteria. If one such form entered a leguminous root, and, while forming nodules, in it, increased, its descendants would be influenced by the parent plant so energetically that they would only possess the full power of working in the case of leguminous families of the same kind, but they would loose it more or less for all others. On sowing, therefore, in any particular soils, nodules can only be formed with certainty when the neutral bacteria, or the form of bacteria adopted for the particular kind of plant in question, are present in sufficient quantity. If in a soil already exhausted, more or less, by heavy leguminous cropping of its neutral bacteria, there be put in another leguminous plant which is not closely related to the previous one, there will no longer be the conditions present for the formation of nodules, or else this formation will be so meagre that it has but little value for the nitrogenous nourishment of the plant. Hence, wherever there are no nodule—bacteria in soils, or these are present only in small quantity, the lacking bacteria should be artificially supplied by inoculation of the soil, through the medium of the proper "nitragin" for the crop in question.

In preparing "nitragin" for commercial use, Nobbe and Hiltner took the "pure cultivation" obtained as already described, transferred it, with suitable precautions, to a glass bottle holding 8 to 10 oz., and containing at the bottom a small quantity of agar-gelatine on which it was then allowed to grow; the bottle was sealed and the contents kept from the light. In this form then "nitragin" is available for use, and can now be purchased by anyone desirous of trying it.—*Tropical Agriculturist.*

The Nutritive Process in Plants.

(Prof. J. Reynolds Green, D. Sc., F. R. S.)

Carbohydrate reserve materials are not always deposited in the shape of starch grains. The roots of our biennial plants furnish us with examples of another kind of store. If we examine the root of a beet or a mangel wurzel we find that the succulent substance is distinctly sweet to the taste. This sweetness is due to the presence of a solution of cane sugar in the sap. The cells are very turgid with water, and this contains a large percentage of cane sugar. Indeed, the manufacture of sugar for the market from beet-root is, as is well known, of great commercial importance. The sugar here remains in solution, and is not deposited as starch as in the former case. We cannot, however, think of it as remaining unchanged after its transit from the leaves. The process of its formation is much like that of the potato at first. But when the leaf starch has been converted into sugar, that sugar is malt sugar as

before, and it is transformed into cane sugar after its arrival in the root.

An onion affords us an instance of yet another kind of carbohydrate deposit. Here the fleshy leaves of the bulb, wrapping it so closely round as to form a very solid body, are charged with an accumulation of grape sugar, a third kind differing from both malt sugar and cane sugar, such as we have seen to occur during the processes already described.

The chief form of deposit in seeds is that of starch, which is the most stable body and the least liable to disturbance. This, no doubt, is why it is adopted by the plant for this reservoir, as generally a longer time, indeed in some cases a very prolonged period, passes before it is called upon to supply nourishment to the young plants. Carbohydrate material is thus stored in many forms and in various places in the plant. Similarly nitrogenous material or proteid has its appropriate reservoirs. We have in many seeds, particularly leguminous ones, stores of this material in the form of definite granular aggregations, which botanists have called *aleurone grains*. If we take, for instance, the pea or bean, we see that the cells contain embedded in their protoplasm structural elements of two sizes. The larger shows the curious concentric marking peculiar to starch, the smaller shows no structure. Instead of turning blue when treated with iodine, they become brown or brownish yellow. These small grains are the aleurone grains, and are made of proteid. This substance is not all uniform in its properties; indeed, we are familiar with many kinds of proteids, which differ very considerably with regard to the fluids in which they will dissolve. Those proteids which most readily occur to our memory are the albumen or white of egg, the globulin of muscle, the fibrin of blood and so on. Though the vegetable proteids are not met with in the same condition exactly as the animal ones, they are nevertheless very much like them in their composition. The aleurone grains of the pea have very striking similarities with the globulin found in muscle. A good deal of the substance is soluble, like that, in a ten per cent. solution of common salt, and salt added to saturation to such a solution of the proteid precipitates it in the form of an amorphous mass. Parts of some aleurone grains are soluble in water, and resemble some of the soluble proteid, of an animal digestion. The albumen or white of egg is very much like a proteid which is found on the underground parts of the asparagus, which must be accordingly called a vegetable albumen.

If we wish to study the deposition of proteids in these vegetable reservoirs, we turn to the seeds rather than to other parts of the plant. In seeds they are very common. The pea and bean have been alluded to; here they occur in conjunction with starch. Other seeds, such as the rape and the linseed, show them associated with oil. In some seeds they are distributed through the whole substance of the embryo; in others they fill the endosperm; in the wheat and barley they occupy a single layer of cells just underneath the outer covering.

In most of the seeds produced by our cultivated plants, the aleurone grains are very simple in structure; indeed, they show no structure, being little rounded masses of granular-looking material. In some foreign seeds, particularly the seeds of the castor oil and the Brazil nut, they are much more complicated. In our own flax we have similar ones. Various solvents need to be used to show the structure, which consists of the following parts. There is an oval casing or matrix, part of which dissolves in water, and the rest in 10 per cent. solution of common salt. Embedded in it is a large regular crystal of proteid matter, which will only dissolve in a saturated solution of salt. This is known as the crystalloid. Between this and the outside of the grain is a rounde l irregular mass of small crystals of the double phosphate of magnesuim and calcium, which is known as the globoid. This of course is not proteid, though it is always embedded in the grain.—*Tropical Agriculturist.*

An American View of Indian Forestry.

India, says a contemporary, would scarcely be looked to for an example of forest preservation, but that country has perhaps the finest national forest policy of any in the world. Before regulations for the conservation of growing timber had been devised and put in force, its forests had been consumed as recklessly as those of the United States, and that is putting the case as strongly as is necessary for emphasis. Fires destroyed, timber for use was cut lavishly and without regard to economy, and the forests were disappearing under careless treatment. Through the present policy India has placed 80,000 square miles under permanent regulation, while 50,000 other square miles are in process of settlement. A large number of trained men now constitute a force to protect the forests. The revenue from these reserves is expected to equal the expenditure for the entire preservative machinery. The product of the forests brings in a liberal and growing surplus. This policy has been in operation for thirty years and has been a great success.—*North Western Lumberman.*

Forestry in Ontario.

The annual report of the Clerk of Forestry for Ontario, Canada, Mr. T. Southworth, gives a general review of the progress and present position of the science of Forestry, with an account of its practical development in the United States.

The forestry problem in Ontario, in its broader aspects as concerning the Crown domain and the policy of establishing forest reserves, is dealt with, reference being made to Algonquin Park and reforestation experiments therein. The results of an inquiry into the working of the Ontario Tree Planting Act of 1883, the observance of Arbor-day in schools, and the effects of clearing the forests in Southern Ontario upon the water supply, are stated at length, and some statistics are given in connection with the great lumbering industries and the growing consumption of timber in the manufacture of paper pulp. The area of the timber-bearing lands still belonging to the Crown in Ontario can only be approximately estimated. In 1893 there was about 21,000 square miles of pine lands under licence, and 24,410 square miles of pine lands unsold. These areas are exclusive of 89,000 square miles, which are more or less timbered, but as they are not supposed to have large quantities of pine upon them, no account has been taken of them by the Crown Lands Department. Taking 80,000 square miles as the timber area of the province—certainly a very low estimate—and reckoning the annual addition of timber over this area at 60 cubic feet per acre, the total addition of timber each year, exclusive of tops and branches, would be 3,072,000,000 cubic feet. According to the report of the Commissioner of Crown Lands for 1894, the timber cut on the Crown lands of all kinds amounted to 60,695,250, cubic feet for that year. This would leave the annual growth, in excess of the annual cut, as 3,011, 304, 750 cubic feet. Unfortunately, the amount of timber destroyed by fire probably exceeds that cut down by the lumbermen, and if fires could be prevented, or even very much lessened, the present rate of cutting on Crown lands could be continued indefinitely.—*Imperial Institute Journal.*

The Woods of Samoa.

Much has been written about Samoan woods, their beauty abundance, and variety, but, says the United States Consul-General at Apia, there is but little foundation for the statement that these woods are likely to become a source of marvellous wealth. There can be no question but that the variety of woods is very extensive and that a limited proportion may in time become valuable. Most of the Samoan woods are very soft and light, and, after becoming well dried, lose not only a great proportion of weight, but become brittle, and of no practical worth to sustain lateral strain. In addition to these there are several varieties of hardwoods, such as the *ifelele*, *talia*, *pau*, *toi*, *nisla*, *tau* and the *ifi* (*Inocarpus edulis*), which can scarcely be said to be abundant. Several of these are

beautiful, very hard, and susceptible of a high polish. One or two varieties grow to a fine size, and are in request among the natives for making kava bowls—wide, shallow vessels hollowed out from cross sections of the butt of the tree, generally from 18 in. to 2 ft. in diameter, and sometimes reaching 3 ft. 6 in. in width. Woods employed for this purpose would doubtless cut into veneers, were there a demand for their peculiar colour and grain by the fancies of fashion. Such, however, does not at present exist, and there is no probability that the mere eccentricity of taste will take a direction to create a demand. A large amount of hardwood is used in making the common canoe of the natives. These are mere logs, hollowed out, and the largest, with rare exceptions, would not require a log more than 2 or 3 ft. in diameter. These canoes are laboriously hollowed out of the log, on the ground where the tree is felled, being hewn away until the boat is a mere shell of from 1 to 1½ in. in thickness, except at the bow and stern. When thus lightened to a minimum, they are dragged and carried to the water. While large trees are numerous, they are not in proportion to the extent covered by the forest, or to that common in a country of merchantable timber, plentiful, or found close together. The dense character of the tropic forest, the deep shade, moisture, and heat have naturally, in such a climate, the influence of so thickly crowding the surface with shoots and young trees that the forest is a mass of slender saplings, overcrowded and dense, all under stimulus of the need of light and air, towering to reach the open space above. In such a bush the largest trees having attained size on some principles of survival of the fittest abound in necessarily limited abundance. These large trees, of nearly all varieties, flare out at the butt in ribs or inverted brackets until they cover a space at the surface of from 12 to even 20 ft. The woods are not of straight grain but are twisted, knotted, gnarled, and contorted in shape, and this bent and knotted quality in the hard and tough varieties produces a most excellent material for knees in small and medium-sized wooden vessels, for which it is much used. In a general sense, it is, perhaps, in this employment that Samoan woods find their greatest value. Much was expected in years gone by from the production of fibres, and an array of plants was cited producing fibres of a merchantable character. The intervening years have allowed the shipments of various samples to Europe for experiment, but the experiments were such that no encouragement or demand followed. The fibre obtained from the covering of the cocoanut is practically the only one produced in the Samoan islands. This article is well known to commerce, and long ago took a place in the manufacture of mats, and, to some extent, as a substitute for hemp in twines. In all cocoanut-growing countries it is, of course, abundant, in proportion to the production of mats. In Samoa it is used by the natives in making all the twine and small rope their needs require and does not enter into export.—*Timber Trades Journal.*

India Rubber.

India-rubber is in a fair way to become one of the prime necessities of civilisation. Numberless human beings, in the class which could not afford wet-nurses, owe their lives to the feeding-bottle. Everybody knows that in the last five years the use of pneumatic tyres for cycles and solid rubber tyres for horse-vehicles has enormously increased our consumption of this article; but quite apart from that more obvious fact, india-rubber is daily being introduced more and more into all sorts of machinery. Highly competent judges say that if the output could be doubled within a year, so many new applications of the material would instantly arise, that the price would not fall appreciably. As a matter of fact, the export of Para rubber has increased within the last twenty-five years from 5,600 tons to 20,000 tons; and the price fetched by the best quality has risen from 2s. to 3s. a pound. It is the one jungle product which society finds indispensable. Hundreds of men have racked their brains to produce a substitute, but none has in the least degree succeeded; and such attempts must be permanently discouraged by the knowledge that india-rubber exists in limitless profusion upon known spots of the world's surface which may at any time be made accessible. In any of the swampy equatorial regions, where vegetation grows rank and sappy, so that a knife will slash through branches as if they were made of cheese, there is pretty certain to occur some one or two of the score of trees which produce rubber. Whole forests of them are known to exist in Central Africa, only waiting to be tapped. But the regions which produced them are precisely the regions most deadly to the white man; and when the rubber is made it has to come to the coast on the heads of negroes, and will not pay the cost of transport. When an accessible forest is discovered it pays like a gold-mine. A tree was discovered near Lagos which was believed to produce rubber; specimens of bark and foliage went home to Kew, and the authorities pronounced it the right thing. In 1895 the export began, and amounted in the year to 2,263 tons, with a value of £270,000 in round figures.

India-rubber would seem to be the one certain source of wealth now locked up in Central Africa, and perhaps the most valuable thing that the region produces or can produce. Ivory is only a fancy article, and palm-oil has many substitutes. Gold no doubt exists there, but, in the first place, is is doubtful whether the pure negro can be made into a miner; and in the second, gold is to be got in regions where white men can live. It seems, therefore, as if the special function of the tropics just now was to produce india-rubber, which is wanted everywhere and cannot be grown elsewhere. No cultivation is need; Nature requires of man very little skill, scarcely any exertion, and only a reasonable avoidance of waste. Yet this is asking more than the African negro is at

present able to give. The great rubber-producing region of the world is the basin of the Amazon, which yields about two-thirds of the entire annual output. The quality of this rubber is immensely superior to all others; the best Para will fetch in England as much as 3s. 6d. a pound; the worst African goes for under a shilling. Brazil has, of course, an immense advantage in its great waterway; ocean-going steamers run twelve hundred miles up the Amazon, whereas every African river, except the Congo, has a bar at its mouth, and cataracts not far distant from the coast-line. On the other hand, the forests in Brazil seem even more impenetrable than in Africa. Not even such roadways as the African man-paths can be maintained against the encroachment of the jungle. But the native Brazilian race is incomparably more intelligent than the negro. Their caoutchouc is better prepared, and what is far more important, they farm the trees as carefully as the Red Indians used to farm the beaver. In Africa the rubber is generally produced not from a forest tree, as in Brazil, but from the *Landolphia*, which is a climbing shrub. The negroes deal drastically with this, and simply cut it down, and then get what milk they can out of it. So, year by year the rubber-trees are destroyed, and year by year they have to go further afield to seek them. If they are left to themselves they simply cease to produce india-rubber, and there is an end of it. If they have the fortune to live in the happy Congo State a certain amount of the stuff is exacted annually from each village; when the trees within reach are exhausted, the collector comes round, finds no rubber, and goes home with a string of ears and noses instead. No doubt the West Coast negro is a trying person to deal with, but these methods have been so long employed unsuccessfully, that civilisation, we hope, may discover a better way, and educate the black man instead of torturing him. One is sorry, therefore, to hear that at Lagos, where the rubber is being produced from a forest tree, the *Kicksia*, the natives have been allowed to over-drain the trees of their milky sap and stop its production. The supply of rubber-producing plants in Central Africa is practically inexhaustible; but the number of places where they exist within easy distance of some export station is small, so far as our present knowledge goes. Yet for the present, speculators will probably hasten to be rich, and if they hit upon a forest will treat it like a mine, anxious simply to take out the maximum at the minimum of cost.

Whether our State, or any other, will ever make this a great branch of its tropical forestry remains to be seen. The Germans, with their usual thoroughness, have a strong scientific staff at the Cameroons. The English, in their usual makeshift way, content themselves with sending home to Kew for suggestions. But the Government of India have at least tried an experiment upon the great scale. No private firm, however wealthy, would embark upon the cultivation of india-rubber; the trees take a matter of

twenty years before they can produce a pennyworth. In addition to that, cultivation must occupy a huge extent of ground of such a nature that no European can enter it during the rainy season, and where the growth is so thick that twenty men might be tapping trees within a mile of the ranger, and be none the wiser. Nevertheless, the Indian Government have a nursery of Para rubber-trees in Assam, * extending over two hundred square miles, which will in time begin to yield ; and if any department can control such a farm the Indian Woods and Forests will. Yet it seems, perhaps, a likelier scheme to carry out Sir Henry Johnston's general policy in this particular, and organise under Indian surveyors a forestry department in East Africa, where the trees exist in plenty. The industry is of course not confined to Africa and South America ; rubber comes from Assam, Rangoon, Borneo, Penang, and Madagascar, amongst other places, but last year's export from Lagos more than doubled the united output of all those that have been named. If we are to stay in Equatorial Africa, it will be a satisfaction to think that we can make some advantage out of it. What it costs to keep slavery in check from Uganda to Commassie only mothers know who have sons in those happy regions. Civilisation is spending a great deal of energy on Africa, and one will be glad to find that Africa makes some return, if it be only to lower the price of pneumatic tyres.—(*Spectator.*)

* *Note*—The Assam plantations at Charduar are not of Para rubber, but of the Indian-rubber Fig.—(*Ficus elastica*).—Hon. Ed.

The Madras Forest Department.

It was recently proposed to appoint the Conservator of Forests of the Central Circle, Madras, as *ex-officio* Joint Secretary of the Board of Revenue for Forest affairs, and to aid the Forest Member in disposing of matters of technical forestry. The proposal has not met with the approval of Government, as it is of opinion that sufficient cause has not been shown for the dislocation of the administrative machinery which this measure would involve, and that the objections to which it is open outweigh the advantages which might possibly be derived from its introduction. —*Madras Mail.*

Baron Sir Ferdinand von Mueller.

News of the death of this distinguished botanist and geographer reached London on the 10th October, causing some surprise, as it was not known here that his health was failing. Born at Rostock in 1825, and educated at Kiel, he emigrated to Australia in consequence of hereditary symptoms of phthisis ; having previously lost his parents. Mueller belonged to the school

of botanists, now fast diminishing in numbers, who began their studies in the field instead of in the laboratory. Before leaving Europe, he devoted much time between 1840 and 1847 to the investigation of the flora of Schleswig-Holstein. On his arrival in Australia, he took service as a druggist's assistant in Adelaide, a post he seems to have held for a brief period, as he was soon engaged in exploring South Australia. From 1848 to 1852 he travelled at his own expense. At this date he was appointed, by Governor La Trobe, to the newly-created post of Government Botanist, and soon visited the previously unexplored Australian Alps. About this period he entered into correspondence with the late Sir William Hooker, which led to the publication of the results of his earier journeys in Hooker's *Kew Journal of Botany*, beginning with the fifth volume. In 1854 the Victorian Institute was founded*—the first institution of its kind, I believe, in Australia proper, though Tasmania had its Royal Society some three years earlier: and Mueller was one of the first and most prolific contributors to its *Transactions*. It was here that he published the new plants collected in the Australian Alps.

In 1855-1856 Mueller was attached as botanist to Gregory's expedition across North Australia, from the Victoria River to the Albert River. In 1857 he was appointed Director of the Melbourne Botanic Garden; but in 1873 he was superseded, owing to his too rigidly scientific management, though he still retained charge of the herbarium and library. Great as were his exertions and enthusiasm on the introduction and cultivation of useful and ornamental plants, he failed from a practical standpoint. His work on "Select extra-tropical plants eligible for Industrial Culture," &c., was an extraordinary success; yet not on account of its practical value, for it has none, but as a work of general reference it is very useful. Nine editions have appeared, including an American, a French, and a German edition.

During the forty-nine years of his Australian life, Mueller was such an unceasing and copious writer, that it is impossible to do more than glance at some of his more important publications. It was from the first his ambition to write a "Flora" of the entire country, and his almost innumerable papers were written with this view; but when it came to the point, the task, for various reasons, was confided to the late George Bentham, and Mueller most cordially co-operated with him by sending his collections and notes to Kew. Of that I can speak with some authority, having acted a very humble, though congenial, part in connection with the earlier volumes of the classical "Flora Australiensis." Mueller, however, found enough to do in publishing the thousands of novelties collected by himself, and by others under his direction. His "Fragmenta Phytographiæ Australiæ" is the chief, but by no means the sole repertorium of his descriptions. Prominent among his

* Subsequently the Philosophical Institution, and then the Royal Society.

more utilitarian works are the illustrated monographs of the genera *Eucalyptus* and *Acacia*. His "Census of Australian Plants," so carefully compiled with regard to dates, references and authorities, is exceedingly useful for purposes of comparison with the floras of other countries, and has been extensively used by the writer and others. But Mueller was much more than a botanist and geographer; he was always a promoter, and often the originator, of movements for the scientific, social and material welfare of the country he had made his home. He was in turn President of the Philosophical Institute, of the Geographical Society (Victorian branch), of the Australian Association for the Advancement of Science, and various other bodies and societies. He has also the reputation of having been a most devout and philanthropical person. And, in spite of his not being a practical horticulturist he did more probably than any other person to promote commercial—that is to say, the useful development of cultural industries in Australia, and more than any other person in the diffusion of the useful Australian plants in other parts of the world. He had probably a wider correspondence than any living botanist, and few are the establishments that have not been in some way benefited by him. The value of his work consists largely in the fact that he did exactly the kind of work that was required in a young country for its material as well as its moral development. It is true that his work exhibits more industry than genius; but, after all, what he undertook gave little scope for the latter quality. There was, however, a weak side in his character, which it would be affectation to pass over entirely, though one would say as little about it as possible. He had an inordinate craving for titles, distinctions, and admiration. This led him to publish, in all sorts of places and languages, what it would have been much better to have kept together, and to indulge in vagaries in botanical nomenclature which are simply deplorable and damaging to his character as a sincere servant of science. Nevertheless, the country to which he devoted nearly half a century of active life was proud of him, and justly so, and willingly honoured him during his lifetime, and will doubtless long cherish his memory

W. BOTTING HEMSLEY.

—*Nature.*

Dr. Henry Trimen.

The friends of Henry Trimen who saw him during his last visit to England a twelve-month ago last summer would not be altogether unprepared for a serious turn in the malady, or rather maladies from which he suffered; yet the news of his death on the 16th October came as a surprise, even to those best acquainted with his condition. For several years he suffered from deafness, which at length became absolute, and then gradual paralysis of the lower limbs set in. This terminated not long since in utter helplessness so far as his legs were concerned, and functional complications

arising he succumbed sooner than was expected. He bore his afflictions with wonderful fortitude, and even cheerfulness; and his only desire was to be spared to complete his great work, the "Handbook to the Flora of Ceylon." But this was not to be. It is to be hoped, however, that a competent botanist will be found to complete this important and admirably planned publication.

Henry Trimen was born in London in 1843, and educated at King's College. In 1865 he gradnated M. B., but he never practised medicine. His favourite study was botany, and he at first specially devoted himself to the British Flora and the sources of vegetable drugs. In 1867 he was appointed Lecturer on Botany at St. Mary's Hospital Medical School; and in 1869 he entered the Botanical Department of the British Museum as Senior Assistant. In the meantime he had published a number of contributions to British Botany chiefly relating to the Flora of Surrey, of Hampshire, and especially of Middlesex. His first work appeared in the *Phytologist* in 1862. Soon he became acquainted with W. F. Thiselton-Dyer, the present Director of Kew Gardens, and the result was their admirable "Flora of Middlesex" published in 1869. This work still holds a position in the first rank among county "Floras." In 1886, Trimen discovered *Wolffia arrhiza* at Staines; the first locality recorded for it in England. It was in that year that the writer became acquainted with Trimen and his associate and made various excursions with them collecting materials for their "Flora." In 1870 Trimen joined Dr. Seemann in editing the *Journal of Botany* and on the death of the latter he assumed the full responsibilities of Editor, which he continued to exercise until he went to Ceylon. Concurrently he was conducting his investigations in Medical Botany, and he associated himself with Robert Bentley in the publication of an illustrated work on "Medicinal Plants," a work of research, comprising four volumes containing upwards of 300 coloured plates. Passing over minor events, we come to the period when he was appointed to succeed Dr. Thwaites in the important and onerous duties of Director of Botanic Gardens of Ceylon—duties he discharged in a manner satisfactory to the home authorities and the colonists. His annual reports are models of what such reports should be. He at once took up the study of the native flora, and was soon actively engaged in the introduction of valuable economic plants of other countries for cultivation in Ceylon. The first volume of his "Handbook" appeared in 1893; the second in 1894; the third in 1895; and from his last letters we learn that he was still working with a will, in spite of his afflictions.

As a botanist, Trimen was a man of great attainments. As a friend, he was sympathetic, sincere, and constant. His work was always thoroughly and conscientiously performed, and is consequently of an enduring nature. This was recognized in his being elected a Fellow of the Royal Society in 1893.

W. BOTTING HEMSLEY.

—*Nature.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

4th November, 1896.

EAST INDIA TEAK.—The deliveries for the first ten months of this year have amounted to 18,297 loads, and for the same period of 1895 they were 15,319 loads. In October this year they have been 2,033 loads. and in October 1895, they were 1865 loads. There has again been a good general demand in London at somewhat better rates, while a further upwards movement has commenced in the price of floating cargoes, each one sold being at some improvement on its predecessor. There is nothing visible which can check this movement for the present.

ROSEWOOD, EAST INDIA.—Small parcels of good logs would sell readily and well.

SATINWOOD, EAST INDIA.—The chief demand is for figury logs, which are scarce.

EBONY, EAST INDIA.—Good wood, in small parcels, would sell readily.

PRICE CURRENT.

Indian teak	per load	£11 10s.	to	£16 10s.
Rosewood	„ ton	£6	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, November, 1896.

Cardamoms		per lb.	1s. 1d.	to	2s. 8d.
Croton seeds		per cwt.	60s.	to	66s.
Cutch		„	9s. 3d.		
Gum Arabic,		„	50s.	to	60s.
Gum Kino		„	£20	to	£25.
Indiarubber,	Assam	per lb.	1s. 10d.	to	2s. 3½d.
„	Burma	„	1s. 4d.	to	1s. 11½d
Myrabolams,	Madras	per cwt.	2s. 6d.	to	4s. 6d.
„	Jubbulpore	„	3s. 9d.	to	6s.
„	Bombay	„	3s. 9d.	to	7s.
„	Bengal	„	3s. 6d.	to	5s. 6d.
Nux Vomica,		„	6s.	to	7s. 6d.
Oil, Lemon Grass		per lb.	2½d.		
Orchella, Ceylon		per ton	11s.	to	15s.
Sandalwood, logs		„	£30	to	£50
„	chips	„	£4	to	£8
Sapanwood,		„	£4	to	£5
Seed lac		„	70s.	to	95s.
Tamarind,		per cwt.	9s.		

Statement of average selling rates of timber and bamboos in Moradabad, Pilibhit, and Bareilly for the month of October 1896.

Description.	Timber scantlings per score.		Bamboos per 100 score.		Remarks
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sál and Sain, &c., Karis 12′ × 5″ × 4″ { Sal ...	50 0 0	60 0 0	...	...	
{ Sain	30 0 0	40 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″	0 8 0	0 10 0		...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	75 0 0	
PILIBHIT.					
Sál, 10′ Tors (Poles) ...	33 0 0	60 0 0	...	...	
Sál and Sain, &c., Karis 12′′ × 5′ × 4″ ...	25 0 0	35 0 0	...	...	
Sál bed posts, 7′ × 2½″ × 2½″ ..	4 0 0	5 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	33 0 0	{ 80 0 0 / 400 0 0	
BAREILLY.					
Sál, 10′ Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sál and Sain, &c., Karis, 12′ × 5″ × 4″	{ 25 0 0 / 40 0 0	{ 35 0 0 / 50 0 0 / 60 0 0	...	..	
Sál bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0		...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	137 0 0	

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

18th November, 1895.—No. 1190—311-7-*F.*—*Erratum.*—In the Notification of this Department No. 1174-F., dated the 12th instant, substitute the following for the first entry :—

(i) Mr. L. G. Smith, Deputy Conservator, 3rd (officiating 2nd) grade, Punjab, to the Central Provinces,

20th November, 1895. No. 1200—193-*F.*—Mr. S. Eardley-Wilmot having resumed charge of the Oudh Forest Circle, North-Western Provinces and Oudh, in the afternoon of the 23rd October, 1895, on return from the privilege leave granted him in the Notification of this Department, No. 817—193-7-F., dated the 30th July last, the following reversions took effect from the same date :— (i) Mr. F. B. Dickinson, Officiating 2nd grade Conservator, Burma—to 3rd grade.

(ii) Colonel J. E. Campbell, I. S. C., Officiating 3rd grade Conservator, Oudh Circle—to Deputy Conservator, 1st grade, North-Western Provinces and Oudh.

No. 1203—239-7-*F.*—Mr. J. S. Gamble having resumed charge of the School Forest Circle in the North-Western Provinces and Oudh and of the Imperial Forest School at Dehra Dun in the forenoon of the 28th October 1895, on return from the privilege leave granted him in the Notification of this Department, No. 879-F., dated the 15th August last, the following reversions took effect from the same date .—

(i) Mr. J. W. Oliver, Officiating 1st grade Conservator, Burma—to 2nd grade.

(ii) Mr. A. Smythies, Officiating 3rd grade Conservator, School Circle, and Officiating Director of the Forest School—to Deputy Director of the Forest School.

(iii) Mr. A. F. Gradon, Officiating Deputy Director of the Forest School—to Instructor.

(iv) Mr. B. B. Osmaston, Officiating Instructor at the Forest School—to Assistant Conservator, North-Western Provinces and Oudh.

17th December, 1895. No. 1290—254-10-*F.*—Mr. C. G. D. Fordyce, Officiating Assistant Inspector-General of Forests and Superintendent of Working Plans (Deputy Conservator, 2nd grade, Bengal), is granted furlough for one year, together with the usual subsidiary leave, with effect from the 20th instant.

2—Madras Gazette.

3rd December, 1895.—A. R. Rama Rau, Forest Ranger, 5th grade is transferred from South Canara to North Malabar—to join expeditiously.

Fifth-grade Ranger Mr. E. D. G. Pierce, Madura District, is granted leave on Medical certificate for six weeks, from 8th August 1895.

629.

Name and designation of officer.	From	To	Remarks.
Mr. H. A. Latham, Assistant Conservator of Forests.	North Coimbatore.	Madura	To do duty under the immediate supervision of the Conservator of Forests, Southern Circle.

10*th December*. 1895.—Ranger P. Venkatakrishnama Naidu from Salem to the Chingleput District upon return from leave.

Two years' furlough, under Article 371 of the Civil Service Regulations, to G. R. Middleton, Ranger, Chingleput District, from 23rd January 1896 or date of relief.

12*th December*, 1895.—Mr. T. P. Peake, District Forest Officer, Madura, is granted, under Article 291 of the Civil Service Regulations, privilege leave for one month and 12 days, in continuation of the Christmas holidays.

3.—BOMBAY GAZETTE.

2*nd December*, 1895.—No. 5623.—In exercise of the power vested in Conservator of Forests by Government Resolution No. 2149, dated 20th March 1889, in the Revenue Department, Mr. D. A. Thomson, Assistant Conservator of Forests, 2nd Grade, and Sub-division Forest Officer, Sátára, has been granted privilege leave of absence for thirty days from 6th November 1895.

6*th December*, 1895.—No. 5695.—Mr. A. G. Edie, Assistant Conservator of Forests, reported himself for duty to the Conservator of Forests, Central Circle, at Poona. on the forenoon of the 20th November 1895, before office hours,

10*th December*, 1895.—No. 9806.—The privilege leave for two months and eighteen days granted to Mr. B. J. Haselden, Assistant Conservator of Forests, First Grade, and Divisional Forest Officer, C. D., Kanara, in Government Notification No. 8986, dated 15th November 1895. published at page 1176, of the *Bombry Government Gazette* of the 21st idem, Part I, is hereby cancelled.

The appointment of Mr, W. E. Copleston to act as Divisional Forest Officer of the Central Division of Kánara, made in Government Notification No. 8987 of the same date, is also cancelled.

17*th December*, 1895.—No. 5913.—Mr. V. R. Gaunde, Extra Assistant Conservator, First Grade, transferred from the Northern to the Central Circle under orders contained in Government Resolution No. 8083, dated 16th October 1895, in the Revenue Department, reported himself for duty to the undersigned on the 16th instant, before office hours, and has been temporarily attached to the Conservator's office.

26*th December*, 1895.—No. 10230.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. J. L. Laird MacGregor to be Second Grade Conservator of Forests.

Mr. R. C. Wroughton to be Third Grade Conservator of Forests.

4.—BENGAL GAZETTE.

28th November, 1895.—No. 5080.—Mr. Henry Haskins Spencer, who has recently been appointed to the Forest Department, Bengal, by Her Majesty's Secretary of State for India, is posted to the Singhbhum Forest Division for general duty.

30th November, 1895.—No. 5127.—Consequent on the appointment of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 2nd grade, to officiate as Assistant Inspector-General of Forests and Superintendent of Working Plans, the following temporary promotions are made among the officers on the Bengal Provincial List of the Indian Forest Service during the absence of Mr. Fordyce, or until further orders, with effect from the 12th October 1895 :—

Mr. W. M. Green, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. C. G. Rogers, F. C. H., Deputy Conservator, 4th grade (on deputation to the Forest School, seconded), to officiate as Deputy Conservator, 3rd grade.

Mr. H. H. Haines, F. C. H., Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. F. Trafford, Assistant Conservator, 1st grade (Provisional), to officiate as Deputy Conservator, 4th grade.

21st December, 1895.—No 6385a.—The following Forest Officers have passed in the subject or subjects noted against their names :—

Mr. W. F. Perree	...	Hindustani by the Lower Standard.
„ H. A. Farrington	...	Procedure and Accounts, and Bengali by the Lower Standard.
„ J. W. A. Grieve	...	Land Revenue, Procedure and Accounts, and Hindustani by the Higher and Lower Standards,
„ R. G. A. Hannah	...	Forest Law, Procedure and Acconnts.
„ T. J. Pocock	...	Forest Law and Land Revenue.
„ A. H. Mee	..	Land Revenue.
Babu Kedar Nath Mozamdar		Procedure and Accounts.

30th December, 1895.—No. 5653.—Mr. A. H. Mee, Extra-Assistant Conservator of Forests, attached to the Sundarbans Forest Division, is transferred to the Darjeeling Forest Division for general duty.

Mr. J. P. Haslett, Extra-Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is transferred to the Sundarbans Forest Division, *vice* Mr. Mee.

5.—N.-W. P. AND OUDH GAZETTE.

5th December, 1895. No. $\frac{980}{\text{vii-455 B-8}}$ The Hon'ble the Lieutenant-Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen to have passed the Departmental examination for Junior Officers held on the 24th October 1894, and the following days, in the subjects specified below :—

IV. Forest Officers,

Land Revenue Systems.
Mr. H. G. Billson.
Mr. E. L. Haslett.
Mr. Keshvanand.

23rd December, 1895. No. $\frac{4248}{11\text{-}86\ A}$ The following temporary promotions and reversions among Forest Officers are notified for general information :—

Entry No.	With effect from.	Consequent on.	Name.	From.	To
1	28th October, 1895.	Mr. B. B. Osmaston's reversion as Offg. Deputy Conservator 4th grade	Mr. M. Hill	Offg. Deputy Conservator, 4th grade	Assistant Conservator, 1st grade
			,, J. C. Tulloch	Offg. Assitant Convator, 1st grade	Assistant Conservator 2nd grade
2	30th Oct. 1895.	Mr. B. B. Osmaston's reappointment as Offg. Instructor of the Forest School	Mr. M. Hill	Assistant Conservator 1st grade	Offg. Deputy Conservator, 4th grade
			,, J. C. Tulloch	Assistant Conservator, 2nd grade	Offg. Assistant Conservator, 1st grade
3	25th Nov. 1895.	Expiry of Mr. W. Shakespear's privilege leave.	Mr. E. A. Down	Offg. Deputy Conservator 2nd grade	Deputy Conservator 3rd grade
			,, A. G. Hobart-Hampden	Offg. Deputy Conservator, 3rd grade	Deputy Conservator, 4th grade
			,, B. B. Osmaston on depution	Offg. Deputy Conservator. 4th grade	Assistant Conservator, 1st grade
			Mr. M. Hill	Offg. Deputy Conservator, 4th grade	Ditto.
			,, J. C. Tulloch	Offg. Assistant Conservator, 1st grade	Assistant Conservator, 2nd grade

6.—PUNJAB GAZETTE.

29th November, 1895.—No. 691 A. L. No. 37 —Mr. H. A. Hoghton, Deputy Conservator of Forests, reported his arrival at Bombay on the 3rd November 1895, on return from the furlough granted him in the Notification of the Central Provinces. No. 2624, dated 7th June, 1894, and at Lahore on the forenoon of the 7th November 1895. He was attached to the Lahore Division with effect from the same date and

assumed charge of the Division on the 11th November, relieving Munshi Fazl Dín, Extra Assistant Conservator of Forests, who remains attached to the Division until further orders.

3rd December, 1895.—No. 707.—The Hon'ble the Lieutenant-Governor is pleased to invest Mr. C. P. Fisher. Deputy Conservator of Forests, Kulu Division, with the power defined in Section 71 (*d*) of Act VII of 1878. (The Indian Forest Act), to be exercised within the limits of the Kulu Forest Division.

9th December, 1895.—No. 718, A. L. No. 38.—Mr. W. Mayes, who has been appointed an Assistant Conservator of Forests of the 2nd Grade and posted to the Punjab, reported his arrival at Bombay on the forenoon of the 18th of November 1995 and at Lahore on the forenoon of the 25th idem.

Mr. Mayes is posted to the Lahore Forest Division from the latter date.

16th December, 1895.—No. 733, A. L. No. 39.—Mr. L. Gisborne Smith, Deputy Conservator of Forests ,having returned to duty at Hazara on the afternoon of the 3rd October 1895, from the privilege leave granted him in Punjab Government Notification No 458, A L. No. 223.—dated 8th August 1895, was transferred to the Chenab Division, to which he will remain attached until further orders. He joined the Chenab Division on the 15th October 1895.

Punjab Government Notification No. 649, A. L. No. 35.—dated the 19th November 1895, is hereby cancelled.

16th December, 1895.—No. 737.—In supersession of Punjab Government Notification No. 542, A. L. No. 291.—dated the 18th September 1895, Lala Jowala Pershad, Extra Assistant Conservator of Forests, is granted 40 days' privilege leave, with effect from the morning of the 4th November 1895.

16th December, 1895.—No. 743.—Bhái Sádhu Singh, Extra Assistant Conservator of Forests, is granted one month's privilege leave under Article 291 of the Civil Service Regulations, with effect from the afternoon of the 13th November 1895.

Lála Daulat Rám, Extra Assistant Conservator of Forests, took over charge of the Jhelum Forest Division from Bhái Sadhu Singh on the same date.

17th December, 1895.—No. 747, A. L. No. 40.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, on transfer to the Central Provinces, was relieved of his duties on the forenoon of the 6th December, 1895.

7.—Central Provinces Gazette.

11th December, 1895.—Mr. A St. V. Beechey, Assistant Conservator of Forests, 2nd grade, Coorg whose services have been placed at the disposal of this Administration by Revenue and Agricultural

Department Notification No. 1160-F. 156-2, dated the 31st October 1895, reported his arrival at Nagpur on the forenoon of the 25th November 1895.

11*th December*, 1895. No. 5246.—With reference to Order No 5038, dated the 28th November 1895, Mr. A St. V. Beechey, Assistant Conservator of Forests, 2nd grade, assumed charge of the duties of Working-Plans Assistant at Balaghat on the forenoon of the 30th November. 1895.

8. Buuma Gazette.

22*nd November*, 1895.—No. 5—With reference to Revenue Department Notification No. 348, dated the 12th November, 1895, Mr. J. Messer Deputy Conservator of Forests, reported his return from privilege leave on the afternoon of the 16th November 1895 and assumed charge of the Working Plans division on the forenoon of the 18th November, 1895.

25*th November*, 1895.—No. 13.—Mr. W. T. T. McHarg, officiating Deputy Conservator of Forests, returned from three months and 15 days' privilege leave granted him in Revenue Department Notification No. 207 (Forests), dated the 27th June 1895, and assumed charge of the Minbu Forest division from Mr. H. H. Forteath, officiating Deputy Conservator of Forests, on the forenoon of the 2nd November, 1895.

25*th November*, 1895 —No. 20.—With reference to Revenue Department Notification No. 374, dated the 12th November, 1895, Mr. H. B. Anthony, Deputy Conservator of Forests, made over, and Mr. H. B. Ward, Deputy Conservator of Forests, resumed charge of, the Bassein-Myaungmya division on the forenoon of the 20th November, 1895.

27*th November*, 1895.—No. 14.—With reference to Revenue Department Notification No. 335 (Forests), dated the 5th November, 1895, Mr. C. W. Allan, Extra Assistant Conservator of Forests, made over, and Mr. H. H. Forteath, officiating Deputy Conservator of Forests, received charge of, the Yaw Forest division on the afternoon of the 7th November, 1895.

29*th November*, 1895.—No. 15.—Mr. C. L Toussaint. Deputy Conservator of Forests, reported his return from the one month and 29 days' privilege leave granted him in Revenue Department Notification No. 250 (Forests), dated the 8th August, 1895, and resumed charge of the Yaw division from Mr. H. H. Forteath, officiating Depty Conservator of Forests, on the forenoon of the 11th November, 1895.

29*th November*, 1895.—No. 16.—With reference to Revenue Department Notification No. 335, dated the 5th November, 1895, Mr. H. H. Forteath, officiating Deputy Conservator of Forests, assumed charge of the Gangaw subdivision, Yaw Forest division, on the forenoon of the 11th November, 1895.

3*rd December*, 1895.—No.—16.—Mr. E. A. O'Bryen, officiating Deputy Conservator of Forests reported his return at Katha from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 240 (Forests), dated the 29 July, 1895, on the afternoon of the 27 November 1895, and resumed charge of the

Katha Forest Division from Mr. H. Jackson, Deputy Conservator of Forests, on the same date.

6*th December*, 1895.—No. 17.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, reported his return from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 204 (Forests,) dated the 27th June, 1895, on the forenoon of the 27th November last, and assumed charge of the Kyaukse subdivision on the same date.

6*th December*, 1895.—No. 293.—Mr. Charles William Doveton, who has been appointed by the Secretary of State for India to be an Assistant Conservator of Forests in Burma, reported his arrival in Rangoon on the 4th December, 1895, after noon.

Mr. Doveton is posted to the Pyinmana Forest division, Eastern Circle, Upper Burma.

6*th December*, 1895.—No. 394.—Mr. Alexander Edward Ross, who has been appointed by the Secretary of State for India to be an Assistant Conservator of Forests in Burma, reported his arrival in Rangoon on the 4th December, 1895, after noon.

Mr. Ross is posted to the Tharrawddy division of the Pegu Circle.

10*th December*, 1895.—No. 6.—Mr H. B. Anthony, Deputy Conservator of Forests, reported his arrival and assumed charge on the afternoon of the 26th November 1895, of the special duties at Kado, to which he was appointed in Burma Forest Department Notification No. 347, dated the 11th November 1895.

12*th December*, 1895.—No. 407.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, is transferred from Pakôkku to the charge of the Magwe subdivision, Minbu Forest division, Taungdwingyi.

No. 408.—Mr. C. B Smales, Assistant Conservator of Forests, is transferred from Taungdwingyi to the charge of the Mingin subdivision, Lower Chindwin Forest division, Mingin.

19*th December*, 1895.—No. 269.—At the departmental examination held at Bassein, Akyab, Moulmein, Tavoy,, Thayetmyo, Minbu, Myingyan, Meiktila, Mandalay, Mogôk, Katha, Bhamo. Mônywa and Taunggyi, on the 4th and 5th November 1895, the following officer passed the examination in Burmese by the higher standard :—

Mr. W. A. Hearsey, Extra Assistant Conservator of Forests,—*with credit.*

21*st December*, 1895.—No. 419.—The following alterations in rank are ordered in the Forest Department ;—

(1). With effect from the 19th October 1895, consequent on the return of Mr. C. W. A. Bruce from privilege leave.

Mr. A. M. Burn-Murdoch, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

(2). With effect from the 23rd October 1895, consequent on the return of Mr. C. H. Hobart-Hampden from furlough :

Mr. H. Carter, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

Mr. G. R. Long, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

(3) With effect from the 26 October 1895, consequent on the return of Mr. J. Nisbet from privilege leave, and the reversion of Mr. F. W. Thellusson to Deputy Conservator, 2nd (officiating 1st) grade:—

Mr. T. A. Hauxwell, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank.

Mr. J. Copeland, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive rank.

Mr. C. L. Toussaint, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive rank.

Mr. F. J. Branthwaite, Deputy Conservator, 4th grade, *substantive provisional*, officiating Deputy Conservator, 3rd grade, to revert to former rank.

Mr. J. Messer, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

Mr. H. H. Forteath, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

(4). With effect from the 2nd November 1895, consequent on the return of Mr. McHarg from privilege leave:

Mr. H. N. Thompson. Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

( ). With effect from the 11th November 1895, consequent on the return of Mr. C. L. Toussaint from privilege leave Mr. C. R. Dun, Assistant Conservator, 1st grade, *substantive provisional*, officiating Deputy Conservator, 4th grade, to revert to his former rank.

(6) With effect from the 18th November, 1895, consequent on the return of Mr. J. Messer from privilege leave:—

Mr. S. Carr, F. C. H., Assistant Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank.

(7) With effect from the 20th November, 1895, consequent on the return of Mr. H. B. Ward from privilege leave:—

Mr. J. C. Murray, Deputy Conservator, 3rd (officiating 2nd) grade to revert to his substantive rank.

Mr. G. F. R. Blackwell, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive rank.

Mr. C. W. A. Bruce, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to revert to his substantive rank.

(8) With effect from the 28th November, 1895, consequent on the return of Mr. E. A. O'Bryen from privilege leave:—

Mr. W. T. T. McHarg, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to revert to his substantive rank

Mr. G. R. Long, Assistant Conservator, 2nd (officiating 1st) grade, o revert to his substantive rank.

9—Assam Gazette.

5th December 1895.—No. 6987G.—Mr. A. R. Dicks, who has been appointed by Her Majesty's Secretary of State to the Forest Department in Assam, having reported his arrival in India, is attached to the Goalpara Forest Division.

10.—Hyderabad Residency Gazette.

25th November 1895. —No. 397.—The Resident is pleased to invest Mr. R. M. Williamson, Assistant Conservator of Forests in Berar, with all the powers described in section 36 (1) of the Berar Forest Law, 1886, as amended by the Berar Forest Law Amendment Law, 1891.

11.—Mysore Gazette.

4th December 1895.—No. 5212—*F.* 318.—In Government Notification No. 4140—F 245, dated the 27th October 1895, granting five days' casual leave to Mr. K. Shamaiengar, Sub-Assistant Conservator of Forests, Mysore District, for the words "from the 3rd" read 'from the 4th.'

12th December 1895 —No. 5491.—60-95 *Fi. F.*—Under Article 218 of the Mysore Service Regulations, the leave on Medical Certificate for six months granted to Mr. G. E. Ricketts, Assistant Conservator of Forests, in Government Notification No. 1746—F. 96, dated 10th August 1895, is hereby extended by nine months.

Mr. C. Appaiya, Assistant Conservator of Forests, will continue in charge of the Plantation Department during the absence of Mr. G. E. Ricketts on leave, or until further orders.

13th December 1895 —No. 5435.—*Ft. F.* 50-95.—Mr. L. Ricketts delivered over, and Colonel J. Campbell Walker received charge of, the office of the Conservator of Forests in Mysore on the afternoon of the 30th November 1895.

21st December 1895.—No. 5706—*Ft. F.* 90-95.—Mr. T. Abdul Karim, Deputy Conservator of Forests, Mysore District, having availed himself of only twenty-seven days' leave from 8th November 1895, out of the one month and twenty days' privilege leave granted to him in Notification No. 4055—Ft 241, dated the 27th October 1895, and returned to duty on the afternoon of 4th December 1895, the unexpired portion of the leave, *viz.*, twenty-three days, is hereby cancelled.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

1st January, 1896.—His Excellency the Viceroy and Governor-General is pleased to confer upon Sardar Hira Sing, Extra Assistant Conservator of Forests in Ajmere-Merwara the tittle of Sardar Bahadur as a personal distinction.

27th December, 1895.—No. 1348—301-3-F.—Consequent on the return to duty of Mr. J. L. Pigot from the leave granted to him in the Notification of this Department No. 2450—170-2 (General) of the 5th September last, Mr. C. G. D. Fordyce reverted, with effect from the 19th instant, to his substantive appointment of Deputy Conservator, 2nd grade, Bengal.

2.—Madras Gazette.

16th December, 1895.—To Ranger M. Kothandarama Mudaliar, from 11th to 28th November, 1895 inclusive, under article 369 of the Civil Service Regulations.

17th December, 1895.—S. Eggia Narayan Sastri, Forest Ranger, Bellary District, is granted a further extension of three months' leave on medical certificate, in continuation of that granted in office Order No. 18 of 1895—96.

18th December, 1895.—C. M. Parthasarady Naidu, Deputy Ranger, 1st Grade, on leave, to act as Temporary Ranger on Rs. 50 from date of his return to duty.

28th December, 1895.—*Removal.*—Fifth-grade Ranger H. E. Kelly, South Coimbatore Division, on sick leave, having been invalided for futher service, his name is removed from the List of Establishment with effect from 5th December, 1895.

18th January, 1895,—*Suspension and reduction.*—Ranger M. Callanan will be considered to have been under suspension from 27th November, 1895 to 10th January 1896, and he will be reduced to 4th Grade, from the latter date.

Transfer.—Ranger M. Callanan from the North Arcot to the Salem District.

No. 8 —Mr. C. J. Wontersz, Extra Assistant Conservator of Forests, Trichinopoly, is granted privilege leave for two months, with effect from or after the 3rd January, 1896, under article 291 of the Civil Service Regulations, 2nd edition.

16th January, 1891.—*Reduction and transfer.*—M. Jambunatha Sastri, Forest Ranger, 4th Grade, Salem district, will be temporarily reduced to the 5th Grade and is transferred to the Trichinopoly district—to join upon expiration of his leave.

3.—Bombay Gazette.

2nd January, 1896.—No. 6062.—Mr. D. A. Thomson, Assistant Conservator of Forests, transferred from the Central to the Southern Circle, reported himself for duty to the Divisional Forest Officer, Central Division of Kánara, on the 12th December, 1895, before office hours.

3rd January, 1896.—No. 49.—His Excellency the Governor in Council is pleased to place Mr. W. E. Copleston under the orders of Mr. T. R. D. Bell, Working Plans Officer, Southern Circle.

4th January, 1896.—No. 3200.—Messrs. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, First Grade, and

Savlaram Balwant Ranade, L. C. E., newly appointed Extra Assistant Conservator of Forests, Fourth Grade (*vide* Gazette Notification No. 8083, dated 16th October, 1895), respectively delivered over, and received charge of, the Dahanu Sub-Division on the forenoon of the 10th December, 1895.

22nd January, 1896.—No. 684.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. W. G. Betham to be Deputy Conservator of Forests, First Grade.

Mr. G. K. Betham to be Deputy Conservator of Forests, Second Grade.

Mr. C. Greatheed to be Deputy Conservator of Forests, Second Grade.

Mr. H. Murray to be Deputy Conservator of Forests, Third Grade.

Mr. R. H. Madan, L. C. E., to hold the First Grade Assistant Conservatorship temporarily provincialised, and to rank for promotion next below Mr. Hodgson.

Mr. Haripad Mitra, L. C. E., to be Extra Assistant Conservator of Forests, First Grade.

Mr. Balvant Ganesh Deshpande to be Extra Assistant Conservator of Forests, Second Grade

Mr. D. M Bijur to be Extra Assistant Conservator of Forests, Third Grade.

21st January, 1896.—No. 6396.—Messrs. H. W. Keys, Deputy, Conservator of Forests, and V. G. Tumne, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the West Khandesh Forest Division on the 3rd January 1896, afternoon.

No. 6397.—Mr. W. R. Gaunde, Extra Assistant Conservator of Forests, First Grade, who was temporarily attached to the office of the Conservator of Forests, C. C., proceeded to Satara on the 2nd January, 1896 to join his new appointment, and received charge of the Satara Subdivision Forest Office from Mr. Wilkins on the 4th January, 1896, before noon.

4.—Bengal Gazette.

7th January, 1896.—No. 123.—Mr. F. B. Manson, Deputy Conservator of Forests in charge of the Darjeeling Forest Division, is placed in charge of the Direction Division, in addition to his other duties.

27th January, 1896.—No. 441 —Mr. W. M. Green, Deputy Conservator of Forests, in charge of the Kurseong Forest Division, is transferred to the charge of the Direction Division and appointed to be Personal Assistant to the Conservator of Forests, Bengal. Mr. Green will relieve Mr. F. B. Manson, Deputy Conservator of Forests, of the charge of the Direction Division.

Mr. A. H. Mee, Extra-Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is transferred to the charge of the Kurseong Forest Division, *vice* Mr. Green.

5.—N.-W. P. and Oudh Gazette.

6th January 1896.—No. 36.—II 720C.—Mr. H. G. Billson, Assistant Conservator of Forests in charge of the Gorakhpore Division of the Oudh Forest Circle, on being relieved by Mr. J. C. Tulloch, was attached to the Kheri Division of the same Circle.

6th January, 1896.—No. 39.—II 720C.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, in charge of the Pilibhit Division of the Oudh Forest Circle, on being relieved by Mr. W. Shakespear, was attached to the Kheri Division of the same Circle.

2th0 January, 1896.—No. 176.—II 175C.—Lala Har Swarup, Extra Assistant Conservator of Forests and Working Plans Officer, Direction Division, Oudh Forest Circle, privilege leave for three months with effect from the 15th January 1896.

6.—PUNJAB GAZETTE.—

10*th Jannary*, 1896.—No. 25.—Bhai Sadhu Sing, Extra Assistant Conservator of Forests, returned from the privilege leave granted him in Notification No. 743, dated 16th ultimo, on the forenoon of the 14th December 1895, and was attached to the Jhelum Division from the same date.

14*th January*, 1896.—No. 45.—Babu Ladha Sing and Lala Jowala Pershad, Extra Assistant Conservators of Forests, respectively made over and received charge of the Mooltan Forest Division on the afternoon of the 24th December 1895, consequent on the transfer of the former to the Montgomery Division.

14*th January*, 1896.—No. 48.—Mr. C. F. Rossiter and Babu Ladha Singh, Extra Assistant Conservators, of Forests, respectively made over and received charge of, the Montgomery Forest Division on the forenoon of the 2nd January 1896, consequent on the departure of the former on three months' privilege leave.

15*th January*, 1896.—No. 52.—Munshi Fazl Din, Extra Assistant Conservator of Forests, is attached to the Chenab Division, with effect from the 3rd December 1895 and until further orders, for work in connection with the Lyallpur Plantation.

17*th January*, 1896.—No. 60 A. L. No. 3.—In continuation of Notification No. 4 A. L. No. 1 dated 3rd January 1896, the following changes which have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each, are notified :—

NAME.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. C. O. Hanson	Provisional Assistant Conservator, 1st Grade.	Assistant Conservator, 1st Grade.	16th December 1895.	Consequent on the death of Mr. Forrest.
Mr. F. Linnell ...	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	18th December 1895.	Consequent on the transfer of Mr. Clutterbuck to the North-Western Provinces.

27th January, 1896.—No. 79.—Lala Jowala Pershad, Extra Assistant Conservator of Forests, returned from the privilege leave granted him in Punjab Government Notification No. 737, dated 16th ultimo, on the 14th December, and was attached to the Mooltan Division with effect from the 21st December, 1895.

3rd January, 1896.—No. 4 A. L. No. 1.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

NAME.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. F. O. Lemarchand —	Officiating Deputy Conservator, 1st Grade.	Provisional Deputy Conservator, 1st Grade.	16th December 1895.	Conservator on the death of Mr. Forrest, Deputy Conservator of Forests.
Mr. A M. Reuther	Provisional Deputy Conservator, 2nd Grade.	Deputy Conservator, 2nd Grade.	Ditto.	
Mr. J. H. Lace	Officiating Deputy Conservator, 2nd Grade.	Provisional Deputy Conservator, 2nd Grade.	Ditto.	
Mr. A. L. McIntire	Provisional Deputy Conservator, 3rd Grade (on furlough).	Deputy Conservator 3rd Grade (On furlough).	Ditto.	
Mr. H. A. Hoghton	Officiating Deputy Conservator, 3rd Grade.	Provisional Deputy Conservator, 3rd Grade.	Ditto.	
Mr. A. V. Monro	Provisional Deputy Conservator, 4th Grade.	Deputy Conservator, 4th Grade.	Ditto.	
Mr. A. W. Blunt	Officiating Deputy Conservator, 4th Grade.	Provisional Deputy Conservator, 4th Grade.	Ditto.	

3rd January, 1896.—No. 8 A. L. No. 2.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. F. Linnell ...	Assistant Conservator, 2nd Grade.	Assistant Conservator, 1st Grade.	1st November, 1895.	Consequent on their having qualified for promotion under Article 37 of the Forest Department Code.
Mr. C. O. Hanson...	Ditto ...	Provisional Assistant Conservator, 1st Grade.	Ditto.	

7.—Central Provinces Gazette.

15*th January*, 1896.—No. 216.—Mr. L. G. Smith, Deputy Conservator of Forests, 3rd (officiating 2nd) grade, whose services have been placed at the disposal of this Administration by Revenue and Agricultural Department Notification No. 1190.—311—7 F, dated the 18th Novembr 1895, is attached to the Chanda Forest Division.

15*th January*, 1896.—No. 217.—With reference to Order No. 816, dated the 15th January 1896, Mr. L. G. Smith, Deputy Cooservator of Forests, 3rd (officiating 2nd) grade, reported his arrival at Chanda on the afternoon of the 14th December, 1895.

15*th January*, 1896.—No. 218.—Mr. L. G. Smith, Deputy Conservator of Forests, 3rd (officiating 2nd) grade, who was attached to the Chanda Forest Division under Notification No. 216, dated the 15th January, 1896, is appointed to have charge of the same Division to relieve Mr. Clutterbuck, Officiating Deputy Conservator, 4th grade, under orders of transfer to the North-Western Provinces and Oudh.

15*th January*, 1896.—No. 219.—With reference to Order No. 218 dated the 15th January, 1896. Mr. L. G. Smith, Deputy Conservator of Forests 3rd (officiating 2nd) grade, assumed charge of the Chanda Forest Division. from Mr. P. H. Clutterbuck, Deputy Conservator of Forests 4th grade, on the afternoon of the 17th December, 1895.

8. Burma Gazette.

19*th December*, 1895.—No. 18.—With reference to Revenue Department Notification No. 393 (Forests), dated the 5th instant, Mr. C. W. Doveton, Assistant Conservator of Forests, reported his arrival at Pyinmana on the forenoon of the 8th December, 1895.

24*th December*, 1895.—No. 17.—With reference to Revenue Department Notification Nos. 407 and 408, dated the 12th December, 1895, Mr. C. B Smales, Assistant Conservator of Forests, made over, and Mr. C. W. Allan. Extra Assistant Conservator of Forests, received charge of, the Magwe subdivision on the forenoon of the 9th December, 1895.

30th December, 1895.—No. 424.—The following alteration in rank is ordered in the Forest Department :—

With effect from the 20th November 1895, consequent on the return of Mr. H. B. Ward from privilege leave :

Mr. A. M. Burn-Murdoch, Assistant Conservator, 2nd (officiating 1st) grade, to revert to his sustantive rank.

31st December, 1895.—No. 21.—With reference to Revenue Department Notification No. 394 (Forests), dated the 5th December 1895, Mr. A. E. Ross, Assistant Conservator of Forests, reported his arrival at Tharrawaddy on the afternoon of the 8th instant.

4th January, 1896.—No. 1.—With reference to Revenue Department Notification No. 408 (Forests), dated the 12th December, 1895, Mr. C. H. Hobart-Hampden, Deputy Conservator Forests, made over and Mr. C. B. Smales, Assistant Conservator of Forests, received charge of, the Mingin subdivision of the Lower Chindwin division on the 28th December 1895.

8th January, 1896.—No 8.—Mr. S. Carr, F. C. H., Assistant Conservator of Forests, is appointed to the charge of the Pyinmana Forest Division during the absence on furlough of Mr. C. E. Muriel, Deputy Conservator of Forests, or until further orders.

8th January, 1896.—No. 9.—Mr. J W. Ryan, Forest Ranger in the Madras Forest Department, is appointed to be an Extra Assistant Conservator of Forests, 4th grade, in this province, on probation.

Mr. Ryan is posted to the Toungoo Fotest Division, which he joined on the 26th December 1895, before noon.

18th January, 1896.—No. 23.—Mr. M. Hill, officiating Deputy Conservator of Forests, on his transfer to Burma from the North-Western Provinces, is appointed to be Personal Assistant to the Conservators of Forests, Eastern and Western Circles, Mandalay.

Mr. Hill reported his arrival in Rangoon on the 18th January 1896, before noon.

21st Jauuary, 1896.—No. 25.—Under the provisions of Article 340 (*b*) of the Civil Service Regulations, furlough to Europe for one year and six months is granted to Mr. H Jackson, Deputy Conservator of Forests, with effect from the 1st March 1896, or the subsequent date on which he may avail himself of it.

9. Assam Gazette.—

30th December, 1895.—No. 7612G.—Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, on return from leave, is placed in charge of the Nowgong Forest Division, with effect from the date of taking over charge from Babu Nilkanta Mukharji.

30th December, 1895.—No. 7613G.—Consequent on the return of Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, from leave, Babu Nilkanta Mukharji, Officiating Extra Assistant Conservator, Forth Grade, reverts to his substantive appointment of Forest Ranger, Fifth Grade, with effect from the 12th December 1895.

11. MYSORE GAZETTE.—

29*th December*, 1895.—No. 5741.—Ft. 380.—Under Article 221 of the Mysore Service Regulations, Mr. C. E. M. Russell, Deputy Conservator of Forests, Kadur District, is granted extraordinary leave without allowances for one year, with effect from the 15th January 1896, or from such other date as he may avail himself of the same.

27*th Jannary*, 1896.—No. 5821.—Ft. F. 93-95.—Mr. C. E. M. Russell, Deputy Conservator of Forests, having been granted extraordinary leave without allowanees for one year, Mr. B. Heera Singh, Assistant Conservator of Forests, Mysore District, is transferred to the Kadur District to do duty as District Forest Officer during the absence of Mr. Russell on leave, or until further orders.

10*th January*, 1896.—No. 6003.—Ft. F. 93-95.—Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Sub-Division, will be in temporary Forest charge of the Kadur District until relieved by Mr. Heera Singh, or until further orders.

2. Mr. Monteriro, Extra Assistant Conservator of Forests, will be in temporary charge of the Shikarpur Sub-Division during the absence of Mr. Srinivasa Rao in Kadur, or until further orders.

11*th January*, 1896.—No. 6246—Ft. F. 64-95.—Under Article 171 of the Mysore Service Regulations, Mr. M. Venkatnaranappa, Assistant Conservator of Forests, Tumkur District, was granted casual leave of absence for one day, *viz.*, the 2nd December 1895.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

6th February, 1896.—No. 83.—69-2 F.—Consequent on the return of Mr. Smythies, Deputy Director of the Forest School, from the privilege leave granted him in the Notification of this Department No. 1167—302-4F., dated the 1st November, 1895, the following reversions took effect from the 30th January, 1896 :—

(i) Mr. Gradon, Officiating Deputy Director—to the appointment of Instructor,

(ii) Mr. B. B. Osmaston, Officiating Instructor—to his substantive appointment of Assistant Conservator, North-Western Provinces and Oudh.

6th February, 1896.—No. 86.—163-26 F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators of the 2nd grade, with effect from the dates specified opposite their names, and are posted to the provinces noted below :—

Mr. W. Mayes, Punjab, 18th November, 1895.
Mr. C. M. McCrie, Central Provinces, 18th November, 1895.
Mr. S. L. Kenny, Central Provinces, 18th November, 1895.
Mr. H. H. Spencer, Bengal, 27th November, 1895.
Mr. A. R. Dicks, Assam, 28th November, 1895.
Mr. C. W. Doveton, Burma, 4th December, 1895.
Mr. A. E. Ross, Burma, 4th December, 1895.

2—Madras Gazette.

29th January, 1896.—With effect from 16th January, 1896, Mr. J. A. Daly, Forester 1st Grade, Trichinopoly, to act as Ranger, 5th Grade, *vice* Mr. Middleton on furlough.

29th January, 1896.—T. Shanmuga Mudaliar, Forest Ranger, Nellore district, is granted two months' privilege leave, under article 291 of the Civil Service Regulations, from 23rd December, 1895.

4th February, 1896.—Mr. J. Woutersz, Extra Assistant Conservator, 3rd Grade, is posted to North Coimbatore.

8th February, 1896.—With effect from 1st February, 1896, Ranger Doraiswami Pillai is reduced to Deputy Ranger, 1st Grade.

15th February, 1896.—Mr. G. W. Thompson, Forest Ranger, Salem District, will be considered to have been on privilege leave, under article 291 of the Civil Serivce Regulations, for twenty-four days from 22nd December, 1895.

12th February, 1895.—No. 71.—Mr. A. B. Jackson, Deputy Conservator of Forests, is granted furlough for one year on medical certificate, under article 340 *(a)* of the Civil Service Regulations.

13*th February*, 1896.—The following promotions are ordered in the Subordinate staff of the Southern Circle, with effect from 1st January, 1896 :—

Names.	Present grade.	Grade to which promoted.	Nature of promotion.
E. J. D. Pierce	5th-grade Ranger (sub. *pro tem*).	Ranger, 5th Grade —	Permanent.
A. Srinivass Chamberlain —	Ranger, 5th Grade [Acting].	Do.	Do.
E. A. Monisse —	Deputy Ranger, I	Do.	Sub. *pro tem*. *Vice* J. W Ryan on other duty in Burma.
F. S. Brito —	Do.	Do.	Acting, *vice* Ranger Arulanantham Pillai on furlough.

3.—Bombay Gazette.

5*th February*, 1896.—No. 6784.—Mr. W. E. Copleston, Assistant Conservator of Forests, who, was posted to the Working Plans Division, S. C., in Government Resolution No. 49, of 3rd January, 1896, relinquished charge of his duties in the Belgaum Division on the afternoon of the 19th January, 1896, and reported himself for duty to Mr. Bell, Divisional Forest Officer, Working Plans, S. C., on afternoon of the 20th idem.

8*th February*, 1896.—No. 1218.—Mr. J. L. Laird MacGregor, Conservator of Forests, Southern Circle, is allowed privilege leave of absence for two months from March 1st, 1896, or such subsequent date as he may avail himself of it.

13*th February*, 1896.—No. 6949.—Messrs V. G. Tumne, Extra Assistant Conservator of Forests, and L. S. Osmaston, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khandesh, on the 25th January, 1896, after noon.

26*th February*, 1896.—No. 1830.—Mr. W R. Woodrow, Deputy Conservator of Forests, Third Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 1833.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. F. R. Desai to act as Conservator of Forests, Third Grade, during the absence of Mr. MacGregor on leave ;

Mr. W. G. Betham to hold administrative charge of the Southern Circle during that period ;

Mr. A. C. Robinson, L. C. E., to hold charge of the office of Divisional Forest Officer, Kolaba, during the absence of Mr. Betham.

4.—Bengal Gazette.

25*th February*, 1896.—No 1012.—In Notification No. 5127 For., dated the 30th November, 1895, for "with effect from the 12th October, 1895" *read* "with effect from the 4th October, 1895."

5.—N.-W. P. and Oudh Gazette.

12*th January*, 1896.—No. 379.—II-115 C. Mr. B. B. Osmaston, Officiating Instructor at the Forest School, Dehra Dun, on being relieved is attached to the Direction Division of the School Forest Circle as Working Plans Officer

19*th February*, 1896.—No. 433.—II. 86A.—With effect from the 30th January, 1896, Mr. F. A. Leete, Officiating Assistant Conservator of Forests, 1st Grade, to revert to his substantive appointment of Assistant Conservator of Forests, 2nd grade.

26*th February*, 1896.—No. 565.—II. 378 C.—Mr. R. C. Milward, Assistant Conservator of Forests, attached to the Bahraich division of the Oudh Forest Circle, to be attached to the Direction Division, Naini Tal, of the Central Cirele.

6.—Punjab Gazette.

4*th February*, 1896.—No. 92.—A. L. No. 4.—In *Punjab Government Gazette* Notification No. 577. A. L. No. 107, dated 23rd November, 1894, *for* 27th October, opposite the name of Mr. J. H. Lace, *read* 2nd November.

Punjab Government Notification No. 403 A. L. No. 18, dated 24th June, 1895, is hereby cancelled.

7.—Central Provinces Gazette.

4*th February*, 1896.—No. 522.—Messrs. L. S. Kenny and C. M. McCrie, Assistant Conservators of Forests, appointed by Her Majesty's Secretary of State for India to the Indian Forests Service, reported their arrival at Bombay on the 22nd November 1895, and were posted to the Nimar and Saugor Forest Divisions respectively as Working-Plans Assistants.

Messrs. Kenny and McCrie assumed charge of their duties at Khandwa and Saugor on the afternoon of the 27th and the forenoon of the 28th November, 1895 respectively.

8. Burma Gazette.

13*th January*, 1896.—No. I.—With reference to Revenue Department Notification No. 420 (Forests), dated the 28th December, 1895, Mr. H. Slade, Deputy Conservator of Forests, made over, and Mr. G. Q. Corbett, Deputy Conservator of Forests, received, charge of, the Tharrawaddy division on the afternoon of the 2nd January, 1896.

Mr. Slade left Rangoon to proceed to Bangkok on the forenoon of the 6th idem.

27*th January*, 1896.—No. 2.—With reference to Revenue Department Notification No. 23 (Forests), dated Rangoon, th 18th instant, Mr. M. Hill, Officiating Deputy Conservator of Forests, assumed charge as Personal Assistant to the Conservators of Forests, Eastern and Western Circles, on the forenoon of the 24th January, 1896.

31*st January*, 1896.—No. 3 —With reference to Revenue Department Notifications No. 355 (Forests), dated the 13th November, 1895, and No. 8 (Forests), dated the 8th January, 1896, Mr. C. E. Muriel, Deputy Conservator of Forests, made over, and Mr. S. Carr, F. C. H., Assistant Conservator of Forests, received, charge of the Pyinmana Forest division on the afternoon of the 4th instant, and Mr. Muriel availed himself of the one year's furlough granted him in the former of the Notifications quoted above from the same date.

1*st February*, 1896.—No. 4.—With reference to Revenue Department Notification No. 363 (Forests), dated the 21st November, 1895, Mr. C. S Rogers, Extra Assistant Conservator of Forests, resumed charge of the Mongmit subdivision of the Ruby Mines Forest division on the afternoon of the 17th December, 1895.

11*th February*, 1896.—No. 44.—Mr. Montague Hill, officiating Deputy Conservator of Forests, North Western Provinces and Oudh, is appointed on his transfer to Burma to be a Deputy Conservator, 4th grade, with effect from the 24th January, 1896.

13*th February*, 1896.—No. 53.—Mr. M. Hill, Deputy Conservator of Forests, Personal Assistant to the Conservators Eastern and Western Circles, is transferred from Mandalay to the charge of the Ruby Mines division during the absence on furlough of Mr. H. Jackson, or until urther orders.

11.—Mysore Gazette.

31*st Jannary*, 1896.—No. 6930.—Ft. F. 119-95, Under Article 171 of the Mysore Service Regulations, Mr. H. Muttappa, Assistant Conservator of Forests on special duty, is granted casual leave of absence for five days, with effect from the 5th February, 1896, or from such other date as he may avail himself of the same.

18*th February*, 1896.—No. 7409—Ft. 482, Mr. L. Ricketts having been permitted to retire from the service of the Mysore Government with effect from the 20th instant, Her Highness the Maharani-Regent takes the opportunity of placing on record her high appreciation of the valuable services of this officer who, during an official career in Mysore extending oves 35 years, discharged the functions of the various high and responsible offices he held with remarkable ability and industry and with singular devotion to duty, and whose retirement depives the State of the services of its most experienced officer.

20*th February*, 1896.—No. 7495—Ft. F. 123-95, Mr. C. Appaiya, Assistant Conservator of Forests, 3rd Grade, will do the duties of headquarter Assistant to the Conservator without prejudice to his duties as Plantation Officer, until further orders.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

20th March 1896.—No. 251-F.—Mr. W. F. Lloyd, Officiating Deputy Conservator of Forests, 4th grade, Andamans, is granted, under Article 343 of the Civil Service Regulations, leave on medical certificate for nine months, with effect from the 7th March 1896, or the subsequent date on which he availed himself of it.

20th March 1896.—No. 254.—The following transfer is made in the interests of the public service :—

Mr. R. L. Heinig, Deputy Conservator of Forests, 4th (Officiating 3rd) grade, Bengal—to the Andamans.

2.—Madras Gazette.

19th February 1896.—Mr. H. Stafford, Ranger, is granted leave on medical certificate for one year from 28th November 1895.

28th February 1896.—Deputy Ranger and Acting Ranger, A. B. Myers, to be a Temporary Ranger on Rs. 80 a month from 1st January 1896, with allowances of a 3rd Grade Ranger while holding charge of the Sigur and Madumalai Ranges, Nilgiri District.

28th February 1896.—Fifth-grade Ranger, A. Srinivasa Chamberlain, granted sick leave for six months from date of relief.

28th February 1896.—Ranger Ramalingam Pillai is granted leave on medical certificate for four months from 11th February 1896.

28th February 1896.—The two months' privilege leave granted in Service Order No. 54 of 1895-96, dated 29th January 1896, to T. Shanmuga Mudaliar, Forest Ranger, Nellore District, is extended by another month.

28th February 1896.—N. Swaminadha Iyer, Deputy Ranger, 2nd Grade, to act as Ranger, 5th Grade, from 27th January 1896, pending the orders of the Board on the arrangements proposed in the upper grades to fill up the place of Mr. Stafford, granted leave on medical certificate.

P. Ramasamiah, Deputy Ranger, 1st Grade, is appointed as Temporary Ranger on Rs. 50, and is posted to Kistna District.

R. O'Hara, Deputy Ranger, 2nd Grade, to act as Ranger, 5th Grade (sub. *pro tem.*), with effect from 20th January 1896, pending the orders of the Board on the arrangements proposed in the upper grades to fill up the place of R. Viswanatham Pantulu, deceased.

22nd March 1896.—No. 126.

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. F.C.L. Cowley-Brown, Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th Grade.	Salem.	Acting District Forest Officer.	During the absence of Mr. C. E. Brasier on furlough, or until further orders.
2	Mr. S. Cox, Assistant Conservator of Forests, 1st Grade.	Godavari.	Ditto.	During the absence of Mr. A. B. Jackson on furlough, or until further orders.

16th March 1896.—No. 119.—Mr. E. R. Murray, District Forest Officer, Anantapur, is granted privilege leave for three months, with effect from or after the 30th March 1896, under Article 291 of the Civil Service Regulations.

No. 120.—Mr. C. E. Brasier, District Forest Officer, Salem, is granted furlough for nine months, with effect from or after the 25th April 1896, under Article 340 (*b*) of the Civil Service Regulations.

17th March 1896.—No. 121.

No.	Name of officer.	District.	Nature of charge.	Remarks.
...	Mr. H. F. A. Wood, Acting Assistant Conservator of Forests, 1st Grade.	Anantapur	Acting District Forest Officer.	During the absence of Mr. E. R. Murray on privilege leave, or until further orders.

3.—Bombay Gazette.

10th March 1896.—No. 2177.—Mr. H. W. Keys, Deputy Conservator of Forests, Fourth Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 7772.—Messrs. W. G. Betham, Deputy Conservator of Forests, and A. C. Robinson, Extra-Assistant Conservator of Forests, respectively delivered over and received charge of the Kolaba Division on the afternoon of the 2nd March 1896.

18th March 1896.—No. 2457.—Mr. T. B. Fry, Deputy Conservator of Forests, Second Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

24th March 1896.—No. 2564.—Mr. T. R. D. Bell, Deputy Conservator of Forests, Fourth Grade, and Divisional Forest Officer, Working Plans, S C., is allowed privilege leave of absence for three months.

No. 2592.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. C. Greatheed to act as Divisional Forest Officer, Násik.

Mr. G. R. Duxbury to be Assistant Conservator of Forests, Násik.

No. 2600.—His Excellency the Governor in Council is pleased to appoint Mr. W. E. Copleston to act as Divisional Forest Officer, Working Plans, Southern Circle, during the absence of Mr. T. R. D. Bell or pending further orders.

4.—Bengal Gazette.

10th March 1896.—No. 1316.—The services of Mr, R. L. Heinig, Deputy Conservator of Forests, 4th and officiating 3rd grade, in charge of the Sundarbans Forest Division, are placed at the disposal of the Government of India in the Revenue and Agricultural Department for duty in the Andamans.

Babu Sreedhur Chuckerburty, Extra Assistant Conservator of Forests, 2nd grade, attached to the Sundarbans Forest Division, will hold charge of that division as a temporary arrangement, *vice* Mr. R. L. Heinig and until relieved by Mr. J. W. A. Grieve, Assistant Conservator of Forests, 2nd grade, attached to the Darjeeling Division.

19th March 1896.—No. 1493.—Babu Sreedhur Chuckerbutty, Extra Assistant Conservator of Forests, second grade, attached to the Sundarbans Forest Division, is posted to the charge of the Palamau Forest Division.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 4th grade, in charge of the Palamau Forest Division, is transferred to the charge of the Sundarbans Forest Division, on being relieved by Babu Sreedhur Chuckerbutty.

Mr. J. W. A. Grieve, Assistant Conservator of Forests, 3nd grade, in charge of the Sundarbans Forest Division, is re-attached to the Darjeeling Forest Division, on being relieved by Mr. Trafford.

30th March 1896.—No. 1677.—Mr. A. H. Mee, Extra Assistant Conservator of Forests, 4th grade, is promoted to the 3rd grade of Extra Assistant Conservators, with effect from the 11th November 1895.

6.—Punjab Gazette.

11th March 1896.—No. 141—In the following Notifications *for* "Mr. G. S. Hart" *read* "Mr. C. P. Fisher," and *vice versâ* :—

No. 504, dated 28th August 1895.
No. 536, dated 16th September 1895.
No. 585, dated 18th October 1895.
No. 663, dated 23rd November 1895.

18th March 1896.—No. 154.—Mr. C. F. Rossiter, Extra Assistant Conservator of Forests, 2nd Grade, is promoted to the 1st Grade with effect from 1st September 1895, to fill an existing vacancy.

7.—Central Provinces Gazette.

24*th February* 1896.—No. 1.—The following sub. *pro tem.* promotions among Forest Rangers in the Southern Circle, Central Provinces, are ordered with retrospective effect from the 13th May 1895, *vice* Mr. A. T. C. Howell, Forest Ranger, Northern Circle, Central Provinces, promoted :—

Mr. B. Inamati Shama Rao, Forest Ranger of the 4th grade, attached to the Chhindwara Forest Division, to be Forest Ranger of the 3rd grade.

Mr. Dhanji Shah Nasarwanji Avasia, Forest Ranger of the 5th grade, attached to the Chanda Forest Division, to be Forest Ranger of the 4th grade.

10*th March* 1896.—No. 5.—Under the authority conferred on him by the Chief Commissioner in *Central Provinces Gazette* Notification No. 3555, dated the 12th June 1890, the Conservator of Forests, Southern Circle, Central Provinces, appoints Mr. B. Inamati Shama Rao, Forest Ranger, to exercise the powers described in Section 67 of Act VII of 1878 (as modified up to the 31st December 1894).

10*th March* 1896.—No. 2.—Consequent on Bapu Rao, Forest Ranger, 4th grade, Northern Circle, Central Provinces having been granted nine months' sick leave, with effect from the 3rd November 1894, the following officiating promotions among Forest Rangers in the Southern Circle, Central Provinces, are ordered :—

Dhanji Shah Nasarwanji Avasia, Forest Ranger, 5th grade, attached to the Chanda Forest Division, to officiate as Forest Ranger, 4th grade, with effect from the 3rd November 1894, to the 12th May 1895, *vice*, Bapu Rao, on leave.

Choga Lal, Forest Ranger, 5th grade, attached to the Bilaspur Forest Division, to officiate as Forest Ranger, 4th grade, with effect from the 13th May 1895, to the 2nd August 1895 *vice* Dhanji Shah Nasarwanji Avasia, promoted sub. *pro tem.* Ranger, 4th grade, *vice* Shama Rao

Mathura Pershad, Forest Ranger, 6th grade, attached to the Nagpur-Wardha Forest Division, to officiate as Forest Ranger, 5th grade, with effect from the 3rd November 1894, to the 2nd August 1895, *vice* Dhanji Shah Nasarwanji Avasia and Choga Lal.

10*th March* 1896.—No. 3.—Consequent on the grant of three months' extraordinary leave without pay to Ponnuswamy, Forest Ranger, 4th grade, attached to the Chanda Forest Division, with effect from the 21st December 1895, the following acting promotions among Forest Rangers in the Southern Circle, Central Provinces, are ordered with effect from that date :—

Choga Lal, Forest Ranger, attached to the Bilaspur Forest Division, to officiate as Forest Ranger, 4th grade, *vice* Ponnuswamy, on leave.

Mathura Pershad, Forest Ranger, 6th grade, attached to the Nagpur-Wardha Forest Division, to officiate as Forest Ranger, 5th grade, *vice* Choga Lal, promoted.

10*th March* 1896.—No. 4.—Consequent on the deputation of Mr. A. Hunt, Forest Ranger, 4th grade, to the Bastar State, the following officiating promotions among Forest Rangers in the Southern Circle, Central Provinces, are ordered with effect from the 15th February 1896 :—

Choga Lal, Officiating Forest Ranger, 4th grade, attached to the Bilaspur Forest Division, to be Forest Ranger, 4th grade, sub. *pro tem.*, *vice* Mr. A. Hunt, seconded.

Mathura Pershad, Officiating Forest Ranger, 5th grade, attached to the Nagpur-Wardha Forest Division, to be Forest Ranger, 5th grade, sub. *pro tem.*, *vice* Choga Lal, promoted.

Vithal Dhondu, Forest Ranger, 6th grade, attached to the Nagpur-Wardha Forest Division, to officiate as Forest Ranger, 5th grade, with effect from the 15th February 1896, *vice* Shankarnath, Forest Ranger, Northern Circle, promoted to officiate in the 4th grade from that date and until the return of Ponnuswamy from leave.

8.—Burma Gazette.

9th March 1896.—No. 5.—With reference to Revenue Department Notifications No. 25 (Forests), dated the 21st January 1886, and No. 53 (Forests), dated the 13th February 1896, Mr. Jackson, Deputy Conservator of Forests, made over, and Mr. M. Hill, Deputy Conservator of Forests, received charge of the Ruby Mines Forest Division on the afternoon of the 4th March 1896, and Mr. Jackson availed himself of the one year and six months' furlough granted him in the former notification from the same date.

11th March 1896.—No. 85.—Mr. H. N. Thompson was transferred from Mônywa to special duty in the Hukong Valley, Bhamo Forest Division, Eastern Circle, Upper Burma, in December last.

No. 86.—On the completion of the duty in the Hukong Valley to which he was posted by this Department Notification No. 85 (Forests), dated the 11th March 1896, Mr. H. N. Thompson, I. F. S., Assistant Conservator, is posted to the charge of the West Salween Forest Division, *vice* Mr. M. Ferrars, I F. S., who proceeds on leave.

12th March 1896.—No. 6.—With reference to Revenue Department Notification No. 53 (Forests), dated the 13th February 1896, Mr M. Hill, Deputy Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservators of Forests, Eastern and Western Circles, on the afternoon of the 28th February 1896.

No. 107.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for three months is granted to Mr. H. B. Anthony, Deputy Conservator of Forests, with effect from the 1st May 1896, or the subsequent date on which he may avail himself of it.

25th March 1896.—No. 112.—The following alterations in rank are ordered in the Forest Department:—

(1) With effect from the 3rd January 1896, consequent on the deputation of Mr. H. Slade for service under the Government of Siam and the return of Mr. G. Q. Corbett from furlough.

Mr. T. A. Hauxwell, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. H. B. Ward, Deputy Conservator, 3rd (Officiating 2nd) grade, to be Deputy Conservator, 2nd grade.

Mr. J. C. Murray, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. C. E. Muriel, Deputy Conservator, 4th (Officiating 3rd) grade, to be Deputy Conservator, 3rd grade.

Mr. G. Q. Corbett, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 5th January 1896, consequent on the departure of Mr. C. E. Muriel on furlough.

Mr. G. F. R. Blackwell, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. W. T. T. McHarg, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. G. R. Long, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(3) With effect from the 24th January 1896, consequent on the appointment of Mr. M. Hill, Officiating Deputy Conservator, North-Western Provinces and Oudh, to be a Deputy Conservator, 4th grade, in Burma.

Mr. W. T. T. McHarg, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade,) to revert to his substantive appointment.

Mr. G R. Long, Assistant Conservator, 2nd (Officiating 1st) grade, to revert to his substantive appointment.

27th March 1896.—No. 117.—Mr. H B. Anthony is posted, on the completion of his special duties at the Kado timber station, to the charge of the Attaran Division.

9.—Assam Gazette.

9th March 1896.—No. 1464-G.—The following is published :—

The undermentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty, as advised in list dated the 7th February 1896 :—

Name.	Service.	Appointment.	Date on which permitted to return.
E. E. Fernandez	...	Deputy Conservator of Forests.	Within period of leave.

25th March 1896.—No. 1667-G.—Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, on return from leave, was attached to the Nowgong Forest Division from the 12th to the 16th December 1895, inclusive.

11.—Mysore Gazette.

9th March 1886.—No. 8126.—Under Article 171 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Sub-Assistant Conservator of Forests, Mysore District, was granted casual leave of absence for three days from the 20th January 1896.

VII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

15th April 1896.—No. 281—116-2-*F*—Mr. C. G. Rogers, Instructor at the Imperial Forest School, Dehra Dun, is granted, under Articles 277 and 291 of the Civil Service Regulations, privilege leave for thirty-two days, with effect from the 11th April 1896.

16th April 1896.—No. 284—80-4-F.—Mr. R. H. E. Thompson, Conservator of Forests, 2nd Grade, Northern Circle, Central Provinces, is granted privilege leave for three months, with effect from the 12th April 1896.

The following temporary promotions are made during Mr. Thompson's absence, or until further orders:—

(i) Mr. F. B. Dickinson, Conservator, 3rd Grade, Burma, to officiate in the 2nd grade.

(ii) Mr. W. P. Thomas, Deputy Conservator, 1st Grade, to officiate as Conservator, 3rd Grade, in charge of the Northern Circle, Central Provinces.

2.—Madras Gazette.

24th March 1896.—Mr. R. O'Hara, Acting Forest Ranger, Godavari District, is granted two months' privilege leave from the 15th April 1896.

2nd April 1896.—The following promotions are ordered in the Subordinate Staff of the Southern Circle:—

Name.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks.
N. Armuga Mudaliyar. ...	Ranger, 2nd Grade	Ranger, 1st Grade.	Acting...	*Vice*-First Grade Ranger V. P. Ramalingam Pillai on sick leave for four months from 11th February 1896.
R. Sundram Pillai ...	Ranger, 3rd Grade	Ranger, 2nd Grade.	Do. ...	
W. B. Jackson ...	Deputy Ranger, 1st Grade.	Ranger, 5th Grade.	Do. ...	*Vice* Fifth Grade Ranger A. S. Chamberlain on sick leave for six months from 18th February 1896.
*	*	*	*	*

6th April 1896.—No. 159.—Mr. W. C. Hayne, District Forest Officer, Chingleput, is granted two months' privilege leave from or after the 15th instant, under Article 291 of the Civil Service Regulations.

8th April 1896.—Ranger N. Balaji Singh granted leave for twenty days from 28th April 1896, under Article 291 of the Civil Service Regulations.

17th April 1896.—Acting Ranger, 5th Grade, C. Hammond, granted leave for three months, from 1st April 1896. The nature of the leave will be subsequently intimated :—

18th April 1896.—No. 170—

No.	Name of officer.	District.	Nature of charge.	Remarks
1	Mr. H. Tireman, Assistant Conservator of Forests, Second Grade.	Chingleput.	Acting District Forest Officer.	During the absence of Mr. W. C. Hayne on privilege leave, or until further orders.

23rd April 1896.—No. 179—Mr. C. D. McArthy, District Forest Officer, North Arcot, is granted privilege leave for one month and twenty-seven days, with effect from or after the 15th May 1896, under Article 291 of the Civil Service Regulations.

23rd April 1896.—No. 186—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. W. Carroll, Extra Assistant Conservator of Forests, 2nd Grade	North Arcot.	Acting District Forest Officer.	During the absence of Mr. C. D. McArthy on leave, or until further orders.

24th April 1896.—*Confirmation of appointment.*—Syed Burhanuddin Hussain, Acting Ranger, 5th Grade, Salem District, is confirmed in that grade.

Appointments.—Acting Ranger J. Daly, Trichinopoly District, to continue to act as Ranger, 5th Grade, sub. *pro tem.*, *vice* Madurainayagam Pillai.

C. Rajagopaul Naidu, Acting Ranger, Cuddapah District, to act as Ranger, 5th Grade, *vice* Mr. Middleton, on leave.

The above arrangements to have effect from 1st April 1896.

Transfers.—Ranger A. P. Ramachandra Mudaliar from Trichinopoly to North Arcot to join.

Acting Ranger Ramaswami Aiyah from North Arcot to Salem, to be relieved as early as possible.

3.—Bombay Gazette.

13th April 1896.—No. 258.—Messrs. T. R. D. Bell, Deputy Conservator of Forests, and W. E. Copleston, Assistant Conservator of Forests, respectively delivered over and received charge of the Working Plans Parties I and II, Southern Circle, on the afternoon of the 8th instant.

14th April 1896.—No. 3098.—Mr. G. K. Betham, Deputy Conservator of Forests, Second Grade, and Divisional Forest Officer, Dhárwár, is allowed privilege leave of absence for three months from 25th April 1896, or such subsequent date as he may avail himself of it.

14th April 1896.—No. 255.—Messrs L. S. Osmaston, Acting Deputy Conservator of Forests, and H. W. Keys, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khándesh, on the 31st March 1896, afternoon.

20th April 1896.—No. 3265.—Mr. J. L. Laird MacGregor, Conservator of Forests, S.C., is granted an extension by one month of the privilege leave of absence for two months allowed to him in Government Notification No. 1218, dated 8th February 1896, published at page 143 of the *Bombay Government Gazette* of the 13th idem, Part I.

28th April 1896.—No. 525.—Messrs. G. R. Duxbury, Assistant Conservator of Forests, and C. Greathead, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Nàsik, on the 18th April 1896, in the afternoon.

29th April 1896.—No. 3456-*A*.—Mr. Hugh Murray, Divisional Forest Officer, Belgaum, passed an examination in Maràthi according to the Lower Standard on the 14th April 1896.

Mr. W. E. Copleston, Assistant Conservator of Forests, Belgaum, passed an examination in Kànarese according to the Higher Standard on the 14th April 1896.

4.—Bengal Gazette.—

23rd April 1896.—No. 2116.—Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 4th Grade, Officiating 3rd Grade, is, on being relieved of the charge of the Jalpaiguri Forest Division by Mr. H. A. Farrington, Assistant Conservator of Forests, 2nd grade, placed on special duty in connnection with the preparation of a Working Plan for that Division.

5.—North-Western Provinces and Oudh Gazette.

7th April 1896.—No. 1059.—II-31*C*.—Colonel E. J. Campbell, Indian Staff Corps, Deputy Conservator of Forests, in charge of Garhwal Division of the Central Forest Circle, furlough out of India for two years and one hundred and twenty-six days under the Furlough Rules of 1868, with effect from 1st May 1896.

8th April 1896.—No 1064.—II-233*C*.—Mr. Keshvanand, Extra Assistant Conservator of Forests, Oudh Circle, leave on medical certificate for seven months with effect from the 8th November 1895.

8th April 1896.—No. 1100.—II-651-*B*.—The services of Mr. E. L. Haslett, Extra Assistant Conservator of Forests 4th Grade, attached to the Naini Tál Division of the Central Forest Circle, are placed temporarily at the disposal of the Chief Commissioner, Ajmere-Merwara, with effect from the date of relinquishing charge of his present duties.

15th April 1896.—No. 1196.—II-31*C*.—Mr. N. Hearle, Deputy Conservator of Forests, attached to the Direction Division of the Central Forest Circle, as Working Plans Officer, to the charge of the Naini Tál Division, of the same Circle, in addition to his other duties.

15th April 1896.—No 1194 —II-31C.—Mr. B. A. Rebsch, Deputy Conservator of Forests, from the Bahraich Division of the Central Forest Circle. to the Garhwal Division of the Central Forest Circle.

15th April 1896.—No. 1195.—II-31*C*.—Mr. F. A. Leete, Assistant Conservator, of Forests, from the Naini Tál Division of the Central Forest Circle, to the Bahraich Division of the Oudh Forest Circle.

6.—PUNJAB GAZETTE.

17th April 1896.—No. 209 —Lala Daulat Rám, and Mr. C. F. Rossiter, Extra Assistant Conservators of Forests, respectively made over and received charge of the Jhelum Forest Division on the afternoon of the 4th April 1896.

21st April 1896.—No. 219.—Lála Daulat Rám, Extra Assistant Conservator of Forests, is transferred from the Jhelum to the Hazára Division, where he assumed charge of his duties on the forenoon of April 18th, 1896.

27th April 1896.—No. 227.—A. L No. 6.—Mr. G. G. Minniken, Deputy Conservator of Forests, is granted privilege leave for three months with effect from 15th April 1896.

27th April 1896 —No. 228.—A. L. No. 7.—Messrs. G. G. Minniken and G. S. Hart, Deputy Conservators of Forests, respectively made over and received charge of the Bashahr Forest Division on the afternoon of the 14th April 1896.

28th April 1896.—No. 232-A. L. No. 8—Mr. Mayes, Assistant Conservator of Forests, is transferred from the Lahore to the Bashahr Division, where he assumed charge of his duties on the afternoon of the 2nd April 1896.

7.—CENTRAL PROVINCES GAZETTE

24th March 1896.—P. Shunkernath, Forest Ranger, 5th Grade, in the Damoh Forest Division, is temporarily promoted until further orders to Forest Ranger, 4th Grade, on Rs. 30 per mensem, with effect from the 15th February 1896, *vice* A. Ponnoswamy Mudaliyar, Forest Ranger in the Southern Circle, Central Provinces, now on three months' extraordinary leave without pay.

9th April 1896.—No. 1457.—Furlough (without medical certificate) for six months, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. L. Gisborne Smith, Deputy Conservator

of Forests, Chanda, with effect from the 29th April 1896, or the subsequent date on which he may avail himself of it.

14th April 1896.—No. 1539.—The following transfers and appointments are ordered in consequence of Mr. L. Gisborne Smith, Deputy Conservator of Forests, Chanda, proceeding on six months' furlough, or until further orders :—

Mr. F. O. Lemarchand, Deputy Conservator of Forests, from Balaghat to Chanda.

Mr. F. S. Barker, Deputy Conservator of Forests, from Seoni to Balaghat.

Mr. J. Linnell, Assistant Conservator of Forests and Working-Plans Assistant, Seoni Division, is placed in charge of that Division.

14th April 1896.—No. 1676.—With reference to Government of India, Revenue and Agricultural Department, Notification No. 284—80-4-F., dated the 16th April 1896, Mr. R. H. E. Thompson, made over charge of the office of Conservator of Forests, Northern Circle, Central Provinces, to Mr. W. P. Thomas, Deputy Conservator of Forests, on the afternoon of the 11th April 1896.

14th April 1896.—No. 1677.—Mr. H. E. Bartlett, Assistant Conservator of Forests and Working-Plans Assistant, Hoshangabad, is placed in charge of the Hoshangabad Forest Division during the absence of Mr. W. P. Thomas, Deputy Conservator of Forests or until further orders.

8.—Burma Gazette.

30th March 1896.—No. 123 —Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, 4th Grade, is promoted to Extra Assistant Conservator, 3rd Grade, with effect from the 1st April 1896.

30th March 1896.—No. 4.—With reference to Revenue Department Notification No. 85 (Forests), dated the 11th March 1896, Mr. H. N. Thompson, Assistant Conservator of Forests, made over charge of his duties at Mônywa on the forenoon of the 28th December 1895.

31st March 1896.—No. 126.—Lieutenant-Colonel C. T. Bingham, I.S.C., Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of leave for ten months.

1st April 1896.—No 132.—Privilege leave for three months is granted under Articles 277 and 291 of the Civil Service Regulations to Mr. J. Allmark, Extra Assistant Conservator of Forests, Rangoon, with effect from the 7the April or any later date on which he may avail himself of it.

2nd April 1896 —No 133.—Mr A. Weston, I.F.S., Deputy Conservator, is appointed to hold charge of the West Salween Division in addition to his other duties, *vice* Mr. M. Ferrars, I.F.S.. who proceeds on leave, until the arrival of Mr. H. N Thompson, I F.S.

No. 134.—Mr. G. F. R. Blackwell, I F S, Deputy Conservator, posted to the charge of the Thaungyin Forest Division, as constituted Department Notification No. 78, dated the 4th March 1896.

No. 135.—Mr. A. Weston, I.F.S., Deputy Conservator, is posted to the charge of the Kado Division, as constituted by this Department Notification No. 78, dated the 4th March 1896.

No. 136.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, is transferred from Taungdwingyi to the charge of the Henzada-Thôngwa Forest Division, *vice* Mr, C. W. Palmer, who proceeds on leave.

7th April 1896.—No. 139.—Mr. F. Thellusson, I.F.S., Deputy Conservator, is appointed to hold charge of the Rangoon Agency and Timber Depôt Division, in addition to his other duties, during the absence on privilege leave of Mr. J Allmark, Extra Assistant Conservator, or until further orders.

11th April 1896.—No. 2.—Mr. A. Weston, Deputy Conservator of Forests, made over, and Mr. H. N. Thompson, Assistant Conservator of Forests, received charge of the West Salween Division on the afternoon of the 8th April 1896.

20th April 1896.—No. 147.—Under the provisions of Article 340 (*b*) of the Civil Service Regulations furlough for one year is granted to Mr. A. Weston, Deputy Conservator of Forests, with effect from the 24th May 1896, or the subsequent date on which he may avail himself of it.

20th April 1896.—No. 148.—The following transfers are ordered in the Forest Department consequent on the departure on leave of Mr. A. Weston, Deputy Conservator of Forests :—

Mr. J. C Murray, Deputy Conservator of Forests, from the Mu Forest Division to the charge of the Kado Division.

Mr. C. L. Toussaint, Deputy Conservator of Forests, from the Yaw Division to the charge of the Mu Division.

Mr. H. H. Forteath, Assistant Conservator of Forests, from the Gangaw Forest Subdivision, to the charge of the Yaw Division.

22nd April 1896.—No. 154.—Under the provisions of Article 369 of the Civil Service Regulations, leave on medical certificate for six months is granted to Mr. W. G. Lane-Ryan, Extra Assistant Conservator of Forests, with effect from the date on which he availed himself of it.

23rd April 1896.—No. 3.—With reference to Revenue Department (Forests) Notification No. 136, dated the 2nd April 1896, Mr. C. W. Allan, Extra Assistant Conservator of Forests, assumed charge of the Henzada-Thôngwa Division on the forenoon of the 21st April 1896.

28th April 1896.—No. 5.—Consequent on the decease of Mr. F. W. Thellusson, Deputy Conservator of Forests, Mr. J. Nisbet, Officiating Conservator of Forests, Pegu Circle, has, in addition to his other duties, assumed temporary charge of the Rangoon Forest Division and of the Government Timber Depôt and Agency Division, with effect from the forenoon of the 27th instant.

28th April 1896.—No. 159.—Mr. J. Messer, Assistant Conservator of Forests, in charge of the Working Plans Division, Tenasserim Circle, is appointed as a temporary measure to hold charge of the Rangoon Division, Pegu Circle, in addition to his other duties.

No 160.—In modification of this Department Notification No. 148, dated the 20th April 1896, Mr. J. C. Murray, Deputy Conservator of Forests, is transferred from Shwebo to the charge of the Rangoon Timber Depôt and Agency Division until the return from privilege leave of Mr. J. Allmark. Upon relief by Mr. Allmark, Mr.

Murray will proceed to Moulmein to take charge of the Kado Division,

29*th April* 1896.—No. 163.—Mr. A. E. Ross, I.F.S., Assistant Conservator, is transferred from Tharrawaddy to the charge of the Paungbyin Subdivision of the Upper Chindwin Forest Division, *vice* Mr. Burn-Murdoch, transferred.

No. 164.—Mr. A. M. Burn-Murdoch, I.F.S, Assistant Conservator, is transferred from Paungbyin to the charge of the Gangaw Sub-division of the Yaw Forest Division, *vice* Mr. Forteath, transferred. absence on privilege leave of Mr. J. Allmark, Extra Assistant Conservator, or till further orders.

9*th April* 1896.—No. 2.—With reference to Revenue Department Notification No. 139, dated the 7th April 1896, Mr. J. Allmark, Extra Assistant Conservator of Forests, made over, and Mr. F. W. Thellusson, Deputy Conservator of Forests, received, charge of the Rangoon Government Timber Depôt and Agency Division on the afternoon of this date.

10*th April* 1896.—No. 144.—Mr. D. H. Allan, Extra Assistant Conservator, is transferred from Alôn to the charge of the Magwe Forest Subdivision of the Minbu Forest Division, *vice* Mr. C. W. Allan, transferred.

10*th April* 1896.—No. 1.—Mr. M. H. Ferrars, Deputy Conservator of Forests, made over, and Mr. A. Weston, Deputy Conservator of Forests, received, charge of the West Salween Division on the forenoon of the 1st day of April 1896.

10.—Hyderabad Presidency Gazette.

1*st April* 1896.—No. 95.—Mr. L. K. Martin, Extra Assistant Conservator of Forests, Akola Division, has been granted privilege leave for two months and 15 days, with effect from the 1st April 1896, or the subsequent date on which he may avail himself of it.

Mr. W. G. J. Peake, Extra Assistant Conservator of Forests, now on special duty in the Akola Division, will be placed in temporary charge of that division during Mr. Martin's absence on leave, or until further orders.

11.—Mysore Gazette.

8*th April* 1896.—No. 9207.—Ft. F. 62-95.—Under Article 171 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Sub-Assistant Conservator of Forests, Heggaddevankote Forest Subdivision, was granted casual leave of absence for four days with effect from the 14th February 1896.

10*th April* 1896.—No. 9316—Ft. F. 91-95.—Under Article 218 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Forest Subdivision, is granted leave on medical certificate for one month with effect from 12th March 1896.

Mr. Monteiro, Extra Assistant Conservator of Forests, will continue in charge of the Shikarpur Sub-division until relieved by Mr. Srinivasa Rao or until further orders.

No.	Name and rank of Officer.	From	To	When to join.
1	Mr. H. Muttappa, Assistant Conservator. ...	Special duty	Bangalore Distrit	On expiry of leave.
2	Mr. Y. Sitaramaiya, Assistant Conservator ...	Bangalore District	Kolar District	On relief by Mr. Muttappa.
3	Mr. Ramaswami Iyer .	Kolar District.	Chitaldrug District.	On relief by Mr. Sitaramaiya.
4	Mr. K. Shamaiengar ...	Chitaldrug District.	Shikarpur Subdivision.	On relief by Mr. Ramaswami Iyer.

15*th April* 1896.—No. 9474.-Ft. F. 91-95.—The one month's leave on medical certificate granted to Mr. B. Srinivasa Rao, Assitant Conservator of Forests, Shikarpur Forest Sub-Division, in Notification No. 9316.—Ft. F. 91-95, dated the 10th April 1896, is hereby extended by two months.

Mr. Monteiro, Extra Assistant Conservator of Forests, will continue of the be in charge of the Shikarpur Forest Sub-Division during the absence of Mr. B. Srinivasa Rao on leave or until further orders.

25*th April* 1896.—No. 204.—Under Article 172 of the Mysore Service Regulations Mr. C. Appaiya, Assistant Conservator of Forests, is granted casual leave of absence for one week with effect from the 27th April 1896 or from such other date as he may avail himself of the same.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

1st May 1896.—No. 329—81-6-F.—Mr. A. F. Gradon, Instructor at the Imperial Forest School, Dehra Dun, is granted furlough for eight months, under Article 340 *(b)* of the Civil Service Regulations, together with the usual subsidiary leave, with effect from the 31st March 1896.

Mr. B. B. Osmaston, Assistant Conservator, North-Western Provinces and Oudh, is appointed to officiate as Instructor at the Forest School during Mr. Gradon's absence.

3.—Bombay Gazette.

8th May 1896.—No. 811.—Mr. G. K. Betham, Deputy Conservator of Forests, delivered over charge of the Dharwar Forest Division to Mr. D. A. Thomson, Assistant Conservator of Forests, on the forenoon of 30th April 1896, and the latter officer handed it over to Mr. W. R. Woodrow, Deputy Conservator of Forests, the same day before office hours.

14th May 1896.—No. 234.—Mr. C. G. Dalia, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, delivered over, and Mr. A. Stewart, Deputy Conservator of Forests, Third Grade, received charge of the Sub-Division Forest Office, Surat, on the afternoon of the 9th April 1896.

14th May 1896.—No. 235.—Mr C. G. Dalia, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, has been granted one month's privilege leave from the 10th April 1896.

18th May 1896.—No. 3981.—The undermentioned officers passed on the 15th April 1896 the Examination in Law prescribed in Rule IV of the Rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department:—

Mr. W. E. Coplestone, Assistant Conservator of Forests, Belgaum.

Mr. D. A. Thomson, Assistant Conservator of Forests, Central Division, Kanara.

18th May 1896.—No. 239.—Mr. C. Greatheed, Deputy Conservator of Forests, Second Grade, delivered over, and Mr. A. N. Master, L. C. E., Extra Assistant Conservator of Forests, Third Grade, received charge of, the East Thana Division, on the afternoon of the 9th April 1896.

18*th May* 1896.—No. 287.—Mr. A. Stewart, Deputy Conservator of Forests, Third Grade, delivered over, and Mr. C. G. Dalia, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, received charge of, the Sub-Division Forest Office, Surat, on the forenoon of the 11th May 1896.

19*th May* 1896.—No. 296.—Mr. A. N. Master, L C. E., Extra Assistant Conservator of Forests, Third Grade, delivered over, and Mr. R. C. Wroughton, Conservator of Forests, N. C., received charge of, the East Thana Division on the afternoon of the 6th May 1896.

No. 345.—Mr. J. Dodgson, Assistant Conservator of Forests, who was attached to the Working Plans Division, N. C., reported himself on the forenoon of the 1st May 1896 for duty.

4.—Bengal Gazette.

1*st May* 1896.—No. 2180.—Mr. E. B. Slane, Extra Assistant Conservator of Forests, attached to the Singhbhum Forest Division, is granted privilege leave, under Article 291 of the Civil Service Regulations, for one month and 28 days, with effect from the 30th March 1896.

25*th May* 1896.—No. 232.—In the notification of this Department, No. 2180 For., dated 1st May 1896, *for* "the 30th March 1896" *read* "the 19th April 1896."

5.—North-Western Provinces and Oudh Gazette.

2*nd May* 1896.—No. 1421-II.-175 C.—In supersession of Notification No. 176-II.-175 C., dated the 21st January 1896, Lala Har Swarup, Extra Assistant Conservator of Forests and Working Plans Officer, Director's Division, Oudh Forest Circle, has been granted leave on medical certificate for three months and sixteen days with effect from the 15th January 1896.

6*th May* 1896.—No. 1451-II.-31 C.—In supersession of Notification No. 1059-II.-31 C., dated the 7th April 1896, Colonel J. E. Campbell, Indian Staff Corps, Deputy Conservator of Forests, in charge of the Garhwal Division of the Central Forest Circle, has been granted furlough out of India for two years with effect from the 1st May 1896.

18*th May* 1896.—No. 1582-II.-392 C.—Mr. N. Hearle, Deputy Conservator of Forests, in charge of the Naini Tal Division of the Central Forest Circle, held charge of the Garhwal Division of the same Forest Circle, in addition to his other duties, from the 11th to the 14th May 1896, inclusive.

6.—Punjab Gazette.

5*th May* 1896.—No. 244—A. L.—No. 9.—At the examination held on the 22nd, 23rd and 24th April 1896, Mr. B. O. Coventry, Assistant Conservator of Forests, passed in all the subjects prescribed by Section 72 of the Forest Department Code,

22nd May 1896.—No. 203—A. L. No. 10.—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. W. P. Thomas	Deputy Conservator, 1st grade.	Officiating Conservator.	12th April 1896.	Consequent on departure of Mr. R. H. E. Thompson, Conservator of Forests, Northern Circle, Central Provinces, on privilege leave from April 12th.
Mr. A. M. Reuther	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	Ditto.	
Mr. H. A. Hoghton	Provisional Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	Ditto.	
Mr. G. S. Hart ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	
Mr. C. O. Hanson ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto.	

23rd May 1896.—No. 268—A. L.—No. 11.—Mr. B. O. Coventry, Assistant Conservator of Forests, 2nd Grade, is promoted to the 1st Grade, with effect from 24th April 1896, to fill an existing vacancy.

7.—Central Provinces Gazette.

14th May 1896.—No. 1784.—With reference to Order No. 1539 dated the 14th April 1896, Mr. F. Linnell, Assistant Conservator of Forests and Working Plans Assistant, Seoni, assumed charge of the Seoni Forest Division from Mr. F. S. Barker, Deputy Conservator of Forests, on the afternoon of 11th April 1896.

Mr. F. S. Barker, Deputy Conservator of Forests, assumed charge of the Balaghat Forest Division from Mr. F. O. Lemarchand, Deputy Conservator of Forests, on the forenoon of the 23rd April 1896.

Mr. F. O. Lemarchand, Deputy Conservator of Forests, assumed charge of the Chanda Forest Division from Mr. L. G. Smith, Deputy Conservator of Forests, on the afternoon of the 28th April 1896.

14th May 1896.—No. 1786.—Mr. L. G. Smith, Deputy Conservator of Forests, Chanda, availed himself, on the afternoon of the 28th April 1896, of the six months' furlough, without medical certificate, granted him by Order No. 1457, dated the 9th April 1896.

14th May 1896.—No. 1788.—Mr. H. E. Bartlett, Assistant Conservator of Forests and Working Plans Assistant, Hoshangabad, posted to the charge of the Hoshangabad Forest Division by Order No. 1677, dated the 29th April 1896, assumed charge of his duties from Mr. W. P. Thomas, Deputy Conservator of Forests, on the afternoon of the 16th April 1896.

24th May 1896.—No. 1982.—Privilege leave for seven weeks, under Article 291 of the Civil Service Regulations, is granted to Mr. A. St. V. Beechy, Assistant Conservator of Forests, attached to the Balaghat Division, with effect from the 21st May 1896, or the subsequent date on which he may avail himself of it.

8.—Burma Gazette.

29th April 1896.—No. 3.—Mr. G. F. R. Blackwell, Deputy Conservator of Forests, made over, and Mr. H. B. Anthony, Deputy Conservator of Forests, received charge of, the Ataran Division, on the afternoon of the 1st April 1896.

30th April 1896.—No. 8.—With reference to Revenue Department Notification No. 154 (Forests), dated the 22nd April 1896, Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, relinquished charge of the Kyauksè Sub-Division of the Mandalay Forest Division on the forenoon of the 9th instant, and availed himself of the six months' leave on medical certificate granted him in the Notification quoted above on the same date.

1st May 1896.—No. 169.—In supersession of this Department Notification No. 118, dated the 3rd April 1895, and so much of this Department Notification No. 259, dated the 19th August 1895, as refers to the appointment of the Forest Officer in charge of the Upper Chindwin Forest Division, the Chief Commissioner appoints Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, to be the Forest Officer to assist the Forest Settlement Officer in the enquiry ordered in this Department Notification No. 259, dated the 19th August 1895, regarding the proposed Uyu Reserve.

4th May 1896.—No. 6.—With reference to Revenue Department Notification No. 160, dated the 28th April 1896, Mr. J. C. Murray, Deputy Conservator of Forests, received charge of the Rangoon Timber Depôt and Forest Agency Division from Mr. J. Nisbet, Officiating Conservator of Forests, Pegu Circle, on the afternoon of the 4th May 1896.

4th May 1896.—No. 9.—With reference to Revenue Department Notification No. 160, dated the 28th April 1896, Mr. J. Murray, Deputy Conservator of Forests, made over, and Mr. G. G. Collins, Deputy Commissioner, Shwebo District, received charge of the Mu Forest Division on the afternoon of the 1st May 1896.

5th May 1896.—No. 4.—Mr. H. B. Anthony, Deputy Conservator of Forests, made over, and Mr. G. F. R. Blackwell, Deputy Conservator of Forests, received charge of the Ataran Division on the afternoon of the 1st May 1896.

6th May 1896.—No. 10.—With reference to Revenue Department Notification No. 148 (Forests), dated the 20th April 1896, Mr. C. L. Toussaint, Deputy Conservator of Forests, received charge of the Mu Forest Division from Mr. G. G. Collins, Deputy Commissioner, Shwebo, on the forenoon of the 4th instant.

6th May 1896.—No. 5.—Mr. H. B. Anthony, Deputy Conservator of Forests, availed himself of the three months' privilege leave granted him in Notification No. 107 (Forests), dated the 21st March 1896, on the forenoon of the 2nd May 1896.

6th May 1896.—No. 7.—With reference to Revenue Department Notification No 159, dated the 28th April 1896, Mr. J. Messer, Assistant Conservator of Forests, assumed charge of the Rangoon Division from Mr, J. Nisbet, Officiating Conservator of Forests, Pegu Circle, on the afternoon of the 6th May 1896.

6th May 1896.—No. 174.—Pending the arrival of Mr. J. Messer, the charge of the Rangoon Division, and pending the arrival of Mr. J. C. Murray, the charge of the Government Timber Depot and Agency Division, was held by Mr. J. Nisbet, Conservator of Forests, Pegu Circle, with effect from the 28th April 1896.

6th May 1896.—No. 6.—With reference to Revenue Department Notification No. 144, dated the 10th April 1896, Mr. D. H. Allan, Extra Assistant Conservator of Forests, made over, and Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, received charge of the Alôn Revenue Sub-Division on the afternoon of the 9th April 1896.

7th *May* 1896.—No. 177.—Under the provisions of Article 343 of the Civil Service Regulations, furlough on medical certificate for three months is granted to Mr. C. W. Palmer, Deputy Conservator of Forests, 2nd grade, with effect from the date on which he availed himself of it.

9th May 1896.—No. 8.—With reference to Revenue Department Notification No. 177 (Forests), dated the 7th May 1896, Mr. C. W. Palmer, Deputy Conservator of Forests, availed himself of furlough on the afternoon on the 25th April 1896.

14th May 1896.—No. 7.—With reference to Revenue Department Notifications Nos. 136 and 144 (Forests), dated the 2nd and 10th April 1896, respectively, Mr. C. W. Allan, Extra Assistant Conservator of Forests, made over, and Mr. D. H. Allan, Extra Assistant Conservator of Forests, received charge of the Magwe Sub-Division of the Minbu Forest Division on the forenoon of the 16th April 1896.

14th May 1896.—No. 198.—Mr. A. E. Ross, I. F. S., Assistant Conservator, is placed in charge of the North Tharrawaddy Forest Sub-Division of the Tharrawaddy Forest Divison, with effect from the date on which he relieves Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, who proceeds on leave.

19*th May* 1896.—No. 7.—Mr. M. H. Ferrars, Deputy Conservator of Forests, availed himself on the forenoon of the 4th April 1896 of the furlough for eight months and two days granted in Revenue Department Notification No. 58, dated the 18th February 1896.

27*th May* 1896.—With reference to Revenue Department Notification No. 198 (Forests), dated the 14th instant, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. A. E. Ross, Assistant Conservator of Forests, assumed charge of the North Tharrawaddy Sub-Division on the afternoon of the 24th May 1896.

9.—ASSAM GAZETTE.

21*st May* 1896.—No. 3211 G.—On the report of the Central Examination Committee, the Chief Commissioner directs the publication, for general information, of the results of the Half-yearly Examination of officers held on the 4th, 5th, 6th, 7th, and 8th May 1886.

FOREST OFFICERS	To Pass in	Passed in	Yet to pass in
Mr. F. E. B. Lloyd, Assistant Conservator.	Assamese ...	Assamese ...	... ...
Mr. A. H. M. Lawson, Assistant Conservator.	Land Revenue. Procedure and Accounts.	...	Assamese. Assamese. Land Revenue. Forest Law. Procedure and Accounts.
Babu Kripanath De, Extra Assistant Conservator.	Forest Law.	Forest Law.	...

22*nd May* 1896.—3225 G.—Privilege leave of absence for twenty-two days under Article 291 of the Civil Service Regulations, is granted to Babu Jogesvar Sur, Extra Assistant Conservator of Forests, Darrang, with effect from the 10th May 1896.

11.—MYSORE GAZETTE.

15*th May* 1896.—No. 9973.—*Ft. F.* 123-95.—Under Article 188 of the Mysore Service Regulations, Mr. C. Appaiya, Assistant Conservator of Forests and Head-quarters Assistant to the Conservator of Forests in Mysore, is granted privilege leave of absence for one month from the 13th May 1896, or from such other date as he may avail himself of the same.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

5th June 1896.—No. 468—129-13-*F.*—Privilege leave for three months and fifteen days, under Articles 277, 282 (*a*) (ii), and 291 of the Civil Service Regulations, is granted to Mr. G. F. Prevost, officiating Conservator of Forests, Tenasserim Circle, Lower Burma, with effect from the 16th May 1896.

Mr. J. Nisbet, officiating Conservator, Pegu Circle is placed in charge of the Tenasserim Circle in addition to his own duties during Mr. Prevost's absence or until further orders.

2—Madras Gazette

18th May, 1896.—No. 247.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. W. W. Batchelor, Assistant Conservator of Forests, 2nd Grade.	Cuddapah	..	To do duty under the supervision of the District Forest Officer.

18th May, 1896.—The three months' leave granted to Ranger C. Hammond, South Canara District, in this Office Service Order No. 250 of 1895-96, will be considered to be "privilege" leave.

18th May, 1896.—Mr. A. R. Mayers, Deputy Ranger, 1st Grade, to be Ranger, 5th Grade, *vice* G. Arulanantham Pillai, retired, but to continue as Temporary Ranger, 3rd Grade.

18th May, 1896.—Mr. C. Hammond, Deputy Ranger, 1st Grade and sub. *pro tem.* Ranger, 5th Grade, to be Ranger, 5th Grade, with effect from 1st May, 1896.

22nd May, 1896.—Ramalingam Pillai, Forest Ranger, 1st Grade is transferred from Madura to Tinnevelly.

23rd May, 1896.—Soondram Pillai, Acting Ranger, 2nd Grade, Nilgiris, is granted privilege leave on medical certificate for three months from date of relief.

24th May, 1896.—To Ranger N. Balaji Singh privilege leave for seven days, under article 291 of the Civil Service Regulations, in continuation of the twenty days' leave notified in page 597 of Part II of the *Fort St. George Gazette*, dated 21st April 1896.

3rd June, 1896.—The Board of Revenue has granted twenty-three days' privilege leave, under section 291 of the Civil Service Regulations, to C. Du Pré Thornton, District Forest Officer, Vizagapatam, from or after 8th June, 1896.

5th June 1896.—No.255.—Mr. T. G. A. Gaudoin, Extra Assistant Conservator of Forests, Cuddapah, is granted privilege leave for three months, with effect from or after the 10th June 1896, under article 291 of the Civil Service Regulations.

6th June 1896.—No. 259.

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. C. D. McArthy	Deputy Conservator of Forests, 4th Grade.	Deputy Conservator, 3rd Grade.	Acting	During the absence of Mr. T. P. Peake on privilege leave from 6th January 1896 to 17th February 1896.
2	Mr. A. W. Lushington.	Do. 3rd Grade.	Do. 2nd Grade.	Do.	During the absence of Mr. C. E. Brasier on furlough, or until further orders.
3	Mr. C. D. McArthy	Do. 4th Grade.	Do. 3rd Grade.	Do.	*Vice* No. 2.
4	Mr. C. Du Pré Thornton ..	Do. do.	Do. do.	Do.	During the absence of Mr. E. R. Murray on privilege leave from or after 30th March 1896.
5	Mr. T. P. Peake.	Do. 3rd Grade.	Do. 2nd Grade.	Do.	During the absence of Mr. Hayne on privilege leave from 21st April 1896.
6	Mr. R. McIntosh.	Do. 4th Grade.	Do. 3rd Grade.	Do.	*Vice* No. 5 and to continue to act in the 3rd Grade during the absence of Mr. C. D. McArthy on privilege leave or until the date of Mr. Thornton's reversion to the 4th Grade.
7	Mr. C. Du Pré Thornton ..	Do. do.	Do. do.	Do.	During the absence of Mr. McArthy on privilege leave. The acting appointment to take effect from the date of Mr. Thornton's reversion to the 4th Grade on the return of Mr. E. R. Murray from privilege leave.

9th June 1896.—Mr. H. J. McLaughlin, Forest Ranger, 2nd Grade, to act as Ranger, 1st Grade, from 28th November 1895, *vice* Mr. Stafford on leave, or until further orders.

P. Ananda Rau, Forest Ranger, 3rd Grade, to act as Ranger, 2nd Grade, from 28th November 1895, *vice* Mr. H. J. McLaughlin.

V. Kalyanarama Aiyar, Acting Ranger, 4th Grade, to act as Ranger, 3rd Grade, from 28th November 1895, *vice* P. Ananda Rau.

R. Venkatesa Mudaliar, Ranger, 5th Grade, to act as Ranger, 4th Grade, *vice* V. Kalyanarama Aiyar, from 20th January 1896,

12th June 1896.—The Board of Revenue has granted one month's privilege leave under article 291 of the Civil Service Regulations, to Mr. A. W. C. Stanbrough, District Forest Officer, South Arcot, from or after 23rd June, 1896

10th June 1896.—No.281.—Mr. C. G. Douglas, District Forest Officer, Nilgiris, is granted privilege leave for two months, with effect from or after the 15th June 1896, under article 291 of the Civil Service Regulations.

10*th June* 1896.—No. 282.—The services of Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, 1st Grade, are placed at the disposal of the Government of India, Revenue and Agricultural Department.

3—BOMBAY GAZETTE.

28*th May* 1896—No. 1356.—Mr. D. A. Thomson, Assistant Conservator of Forests, who was ordered to relieve Mr. G. K. Betham, Divisional Forest Officer, Dharwar, relinquished charge of his duties in the Central Division of Kanara in the afternoon of the 27th April 1896.

1*st June* 1896.—No. 4317.—Mr. G. P. Millett, Deputy Conservator of Forests, Fourth Grade, and Divisional Forest Officer, Working Plans, N. C., is allowed furlough for eighteen months.

No. 4333.—His Excellency the Governor in Council is pleased to appoint Mr. A. G. Edie to be under the orders of the Conservator of Forests, Northern Circle.

No. 1282.—In exercise of the power vested in Conservator of Forests by Government Resolution No. 2149, dated 20th March 1889, in the Revenue Department, Mr. G. R. Duxbury, Assistant Conservator of Forests, Násik, was granted privilege leave of absence for fifteen days, which he availed himself from 11th May 1896, before office hours, and he returned to duty on the forenoon of the 26th.

3*rd June*. 1896.—No. 4370.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. T. B. Fry, on return to duty, to be Divisional Forest Officer Working Plans, Central Circle.

Mr. L. S. Osmaston to be Assistant under Mr. Fry pending further orders.

5*th June*, 1896.—Mr. Shesho Manju, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, Supa, N. D., Kanara, is granted thirty days' privilege leave with effect from 10th May 1896.

6*th June* 1896.—No. 1439.—Messrs. L. S. Osmaston, acting Deputy Conservator of Forests, and T. B. Fry, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, Central Circle, on the 3rd instant, in the afternoon.

15*th June* 1896.—No. 563.—Mr. A. G. Edie, I. F. S., having been attached to the Northern Circle, reported himself on Monday, the 8th instant, before office hours.

15*th June* 1896.—No. 1668.—Mr. A. G. Edie, Assistant Conservator of Forests, was relieved of his duties in the Poona Forest Division, by Mr. Fagan on the 6th June 1896, in the afternoon, in order to proceed to the Northern Circle, where he has been posted by Government Resolution No. 4333, dated 1st June 1896, in the Revenue Department.

16*th June* 1896.—No. 4719.—His Excellency the Governor in Council is pleased to appoint Mr. O. H. L. Napier. Assistant Conservator of Forests, First Grade, to do duty as Divisional Forest Officer, Working Plans, Sind Circle, with effect from 1st May 1896.

18*th June* 1896.—No. 595.—Mr. G. P. Millett, I. F. S., delivered over and Mr. J. Dodgson, I. F. S., received charge of the Working Plans Division, N. C., on the afternoon of the 15th June 1896.

No. 1889.—Mr. A. C Robinson, Extra Assistant Conservator of Forests, delivered over, and Mr. W. G. Betham, Deputy Conservator of Forests, received, charge of the Colaba Division on the forenoon of 13th June 1896.

4.—BENGAL GAZETTE.

8th June 1896.—No. 2428.—Mr. E. E. Slane, Extra Assistant Conservator of Forests, attached to the Singhbhum Division, is posted to the charge of the Angul Forest Division, on the expiry of the 1 month and 28 days' privilege leave granted him under article 291 of the Civil Service Regulations, in this Department Notification No. 2180 For., dated 1st May 1896.

23rd June 1896.—No. 4029A.—The following Forest Officers have passed in the subjects noted against their names :—

1. Mr. H. A. Farington—Forest Law and Land Revenue System.
2. ,, T. J. Pocock—Hindustani by the Lower standard.

5.—NORTH-WESTERN PROVINCES AND OUDH GAZETTE.

3rd June 1896.—$\frac{1773}{11-89A}$.—The following temporary promotions among Forest Officers are notified for general information:—

Entry No.	With effect from	Consequent on	Name.	From	To
1	31st March 189 6.	Mr. B. B. Osmaston's appointment as Officiating Instructor, Forest School.	Mr. F. A. Leete.	Assistant Conservator, 2nd grade.	Officiating Assistant Conservator, 1st grade.
2	11th May 1896.	Col. J. E. Campbell's departure on furlough.	,, W. Shakespear	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.
			,, E. A. Down	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.
			,, A. G. Hobart-Hampden.	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.
			,, B. B. Osmaston (on deputation as Officiating Instructor, Forest School)	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.
			Mr P. H. Clutterbuck	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.
			,, J. C. Tulloch	Assistant Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.

8th June 1896.—No. 1790S.—The services of Mr. E. L. Haslett Extra Assistant Conservator of Forests, 4th grade, which by Notification No. 1100—II—651B., dated the 8th April 1896, were temporarily placed at the disposal of the Chief Commissioner, Ajmere-Merwara, are replaced at the disposal of the Government of the North-Western Provinces and Oudh, with effect from 10th May 1896.

15th June 1896.—No. $\frac{01}{\text{II-651 B.}}$ Mr. E.L. Haslett, Extra Assistant Conservator of Forests, on return from deputatation in Ajmere, is attached to the Naini Tál Division of the Central Forest Circle.

29th June 1896.—No. $\frac{1962}{\text{II-651 B.}}$ Babu Raghu Nath Pathak, Extra-Assistant Conservator of Forests, attached to the Garhwal Division of the Central Forest Circle, to the charge of the Bundelkhand Division of the same Forest Circle, *vice* Mr. E. A. Down, transferred.

No. $\frac{1966}{\text{II-233O.}}$ Mr. Keshvanand, Extra Assistant Conservator of Forests, on return from leave, is attached to the Direction Division of the Oudh Forest Circle, as Working Plans Officer.

6.—PUNJAB GAZETTE.

1st June 1896. No. 278.—Munshi Fazl Din, Extra Assistant Conservator of Forests, is transferred from the Chenab and attached to the Kángra Division, where he assumed charge of his duties on the 16th May 1896.

4th June 1896.—No. 288.—Mr. G. S. Hart, Deputy Conservator of Forests, is appointed Political Assistant to the Superintendent of Hill States, Simla, *vice* Mr. G. G. Minniken, Deputy Conservator of Forests, on privilege leave, with effect from 15th April 1896.

10th June 1896—No. $\frac{294}{\text{A. L. No. 12.—}}$ The following changes have taken place in the list of Forest officers in the Associated Provinces with effect from the dates specified against each:—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. J. H. Lace ...	Provisional Deputy Conservator, 2nd Grade.	Officiating Deputy Conservator, 1st Grade.	15th April 1896.	Consequent on the departure of Mr. Minniken on 3 months' privilege leave on April 15th.
Mr. H. Calthrop ...	Officiating Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	Ditto	
Mr. A. V. Monro ...	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto	

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. F. C. Hicks ...	Officiating Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	29th April 1896.	Consequent on the departure of Mr. Gisborne Smith on furlough.
Mr. A. W. Blunt ...	Provisional Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto	
Mr. B. O. Coventry	Provisional Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	

10*th June* 1896.—No. $\frac{295}{\text{A. L. No. 13}}$—In Notification No. $\frac{268}{\text{A. L. No. 11.}}$ dated 23rd May, after the word "promoted" add "provisionally."

25*th June* 1896.—No. $\frac{307}{\text{A. L. No. 14}}$—Mr. H. A. Hoghton, Deputy Conservator of Forests, and Mr. B. O. Coventry, Assistant Conservator of Forests, respectively delivered over and received charge of the Lahore Division on the afternoon of the 7th May 1896 at Lahore, and respectively received and delivered over charge of the Rawalpindi Division on the forenoon of the 11th idem at Rawalpindi.

Mr. Coventry held charge of both Divisions during the period comprised between the dates mentioned above.

29*th June* 1896.—No. $\frac{312}{\text{A L No 5}}$—Mr. A V. Monro, Deputy Conservator of Forests, has been granted 27 days' privilege leave with effect from the 14th June 1896.

29*th June* 1896.—No. $\frac{316}{\text{A L No 16}}$—Mr. A. V. Monro, Deputy Conservator of Forests, and Lala Doulat Ram, Extra Assistant Conservator of Forests, rerpectively made over and received charge of the Hazara Forest Division on the afternoon of the 13th June 1896:.

7.—Central Provinces Gazette.

21*st May*, 1896.—Owing to the reverison of Rahman Khan, Forest Ranger, 6th grade, to Forester, 1st grade, Mr. W. J. Anthony, passed Stipendiary Student of the Imperial Forest School, Dehra Dun, having complied with the conditions laid down in Section 29 (1) of the Forest Department Code, 4th edition, is appointed as Forest Ranger 6th grade, on Rs. 50 per mensem, on the permanent establishment, with effect from the 1st April 1896, and is posted to the Narsinghpur Forest Division.

25*th May*, 1896. The following passed Stipendiary Students of the Imperial Forest School, Dehra Dun, having complied with the conditions laid down in Section 29 (1) of the Forest Department Code, 4th edition, areappointed Forest Rangers, 6th grade, on a salary of Rs. 50 per mensem, with effect from the 1st April 1896, on the temporary establishment, and are posted to the Forest Divisions noted against their respective names :—

Vinaik Chimnaji	... ...	... Nimar
Surenda Nath Chatterji Chintaman Vishwanath Jairam Raghunath	...	... Mandla.

1st June 1896.—No. 2080.—Mr. A. St. V. Beechey, Assistant Conservator of Forests and Working-Plans Assistant, Balaghat, is transferred to Nagpur, and temporarily attached to the Direction Division.

18th June 1896.—No. 2202.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, attached to the Balaghat Division, availed himself, on the afternoon of the 25th May 1896, of the seven weeks' privilege leave granted him by Order No. 1982, dated the 28th May 1896.

8.—BURMA GAZETTE.

28th May 1896.—No. 8.—With reference to Revenue Department Notification No. 148, dated the 20th April 1896, Mr. C. L. Toussaint, Deputy Conservator of Forests, made over, and Mr. H. H. Forteath, Assistant Conservator of Forests, received, charge of the Yaw Division on the forenoon of the 1st May 1896.

5th June 1896.—No. 219.—The following alterations in rank are ordered in the Forest Department:—

(1) With effect from the 5th March 1896, consequent on the departure of Mr. H. Jackson on furlough:
Mr. M. Hill, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.
Mr. W. T. T. McHarg, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.
Mr. G. R. Long, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(2) With effect from the 31st March 1896, consequent on the departure on furlough of Mr. A. F. Gradon, Instructor at the Forest School, Dehra Dun:
Mr. F. J. Branthwaite, Deputy Conservator, 4th grade, *substantive provisional*, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.
Mr. C. R. Dun, Assistant Conservator, 1st grade, *substantive provisional*, to be Assistant Conservator, 2nd grade, and to officiate as Assistant Conservator, 1st grade.

(3) With effect from the 4th April 1896, consequent on the departure of Mr. M. H. Ferrars on furlough:
Mr. E. S. Carr, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.
Mr. J. Copeland, Deputy Conservator, 3rd grade, to officiate as Depnty Conservator, 2nd grade.
Mr. C. L. Toussaint, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.
Mr. C. W. A. Bruce, Assistant Conservator, 1st grade, to officate as Deputy Conservator, 4th grade.
Mr. A. M. Burn-Murdoch, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(4) With effect from the 19th April 1896, consequent on the departure of Mr C W Palmer on furlough :
Mr. H. B. Anthony, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade
Mr. F. J. Branthwaite, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade
Mr. C R. Dun, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th Grade.
Mr. S. Carr, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(5) With effect from the 28th April 1896, consequent on the death of Mr. F. W. Thellusson :
Mr. H. B. Ward, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.
Mr. A. Weston, Deputy Conservator 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade
Mr. C. H. Hobart-Hampden, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. A F. Gradon, Deputy Conservator, 4th grade, to be Deputy Conservator, 3rd grade.
Mr. F. J. Branthwaite, Assistant Conservator, 1st grade, to be Deputy Conservator, 4th grade, and to continue to officiate as Deputy Conservator, 3rd grade.
Mr. H. Carter, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.
Mr. C. R. Dun, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to continue to officiate as Deputy Conservator, 4th grade.
Mr. H. N. Thompson, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade.

18th June 1896.—No. 193.—At the departmental examination held at Rangoon on the 1st and 2nd June 1896 the following officers passed the examination in Burmese by the Elementary standard :—
Mr. S. A. Wood, Forest Ranger.
Mr. J. L. Hefferman, Forest Ranger.

10th June 1896.—No. 225.—This Department Notification No. 164, dated the 29th April 1896, transferring Mr. A. M. Burn-Murdoch from Paungbyin to Gangaw, is hereby cancelled.

9.—Assam Gazette.

1st June 1896.—No. 3432 G.—With effect from the 4th May 1896, Mr. F. E. B. Lloyd, Assistant Conservator of Forests, 2nd Grade, is promoted to be Assistant Conservator of Forests, 1st Grade (substantive provisional).

11.—Mysore Gazette.

26th May 1896.—No. 10280.—Ft. F. 93-95, Consequent on the grant of sick leave to Mr. Russell in Notification No. 1377—G. F. 13-93, dated 27th July 1894, Mr. B. Srinivasa Rao, Assistant Conservator of For-

ests, held charge of the Kadur District Forest office from the forenoon of the 10th July 1894 to the forenoon of the 11th March 1895 and Mr. C. Appaiya, Sub-Assistant Conservator of Forests, was in charge of the Shikarpur Forest Sub-Division from the afternoon of the 5th July 1894 to the afternoon of the 25th March 1895.

29*th May* 1896.—No. 10367—Ft F. 92-95—Under Article 188 of the Mysore Service Regulations, Mr. Y. Sitaramaiya, Assistant Conservator of Forests, Bangalore District, is granted privilege leave of absence for two months and sixteen days with effect from the 2nd June 1896, or from such other date as he may avail himself of the same.

29*th May* 1896.—No. 10466—Ft F. 92-95.—Under Article 172 of the Mysore Service Regulations Mr. Y. Sitaramaiya, Assistant Conservator of Forests, Bangalore District, was granted casual leave of absence for fourteen days with effect from the 6th May 1896.

18*th June* 1896.—No. 11059.—Ft. F. 61-95.—Under Article 172 of the Mysore Service Regulations Mr. C. Narayana Rao, Deputy Conservator of Forests, Shimoga District, is granted casual leave of absence for fifteen days with effect from the 10th June 1896.

18*th June* 1896.—No. 11062.—Ft. F. 123-95.—Mr. C. Appaiya, Assistant Conservator of Forests, having availed himself of the one month's privilege leave granted to him in Notification No. 9973—Ft. F. 123-95, dated 15th May 1896, from the forenoon of the 15th May and returned to duty on the forenoon of the 6th June 1896, the unexpired portion of the leave, *viz.*, seven days is hereby cancelled.

22*nd June* 1896.— No. 41031·—Mis 2101.—The following temporary promotions of Forest officers are ordered with effect from the dates on which Messrs. G. Ricketts and C. E. M. Russell proceeded on leave :—

During Mr. G. Ricketts' absence on leave—

1. Mr. B. Hira Singh, from Assistant Conservator, 3rd class, to Assistant Conservator, 2nd class.
2. Mr M. G. Rama Rao, from Sub-Assistant Conservator, to Assistant Conservator, 3rd class.

During Mr. C. E. M. Russell's absence on leave—

1. Mr. Abdul Karim, from Deputy Conservator, 2nd class to Deputy Conservator, 1st class.
2. Mr. C. Narain Rao, Deputy Conservator, 3rd class, to Deputy Conservator, 2nd class.
3. Mr. S. A. Bapu Rao, from Assistant Conservator, 1st class, to Deputy Conservator, 3rd class.
4. Mr. M. Venkatanaranappa, from Assistant Conservator, 2nd class, to Assistant Conservator, 1st class.
5. Mr. C. Appaiya, from Assistant Conservator, 3rd class, to Assitant Conservator, 2nd class
6. Mr. K. Shamaienga, from Sub-Assistant Conservator, to Assistant Conservator, 3rd class

25*th June*, 1896—No. 11180—*Ft. F.* 92-94—Mr. Y. Sitaramaiya, Assistant Conservator of Forests, delivered over, and Mr. H Muttappa, Assistant Conservator of Forests, received, charge of the Bangalore District Forest Office on the afternoon of the 6th instant.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

29th June 1896.—No. 558—58-17-F.—With reference to the Madras Government's Notification No. 282, dated the 12th instant, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, 1st grade, is transferred to Burma in the interests of the public service.

8th July 1896.—No. 597—58-21-F.—Mr. A. H. M. Lawson, Assistant Conservator of Forests, 2nd grade, Assam, is transferred to Burma in the interests of the public service.

16th July 1896.—No. 670—161-4-F.—Mr. F. B. Bryant, Deputy Conservator, 3rd grade, North-Western Provinces and Oudh, is appointed to be Assistant Inspector-General of Forests and Superintendent of Working-Plans, with effect from the 1st July 1896, *vice* Mr. J. L. Pigot, granted furlough.

From the same date Mr. Pigot reverted to the Assam Forest List.

22nd July 1896.—No. 704—80-6-F.—Mr. R. H. E. Thompson, Conservator of Forests, 2nd grade, having returned from the privilege leave granted him in the Notification of this Department, No. 284-F., dated the 16th April last, and resumed charge ef the Northern Forest Circle in the Central Provinces from Mr. W. P. Thomas, Officiating Conservator, 3rd grade, the following reversions took effect from the 12th July 1896 :—

(i) Mr. Thomas—to Deputy Conservator, 1st grade, Central Provinces.

(ii) Mr. F. B. Dickinson, Officiating Conservator, 2nd grade, Burma—to Conservator, 3rd grade.

2.—Madras Gazette.

22nd June 1896.—No. 307.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. H. Tireman, Assistant Conservator of Forests, First Grade (acting), and Acting District Forest Officer, Chingleput.	North Malabar.	Permanent.	To join on relief by Mr. Hayne.

22nd June 1896.—No. 311.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. J. L. MacC. O'Leary Assistant Conservator of Forests, 1st grade.	Ganjam.	Acting District Forest Officer.	During the absence of Mr. R. McIntosh on leave, or until further orders.

24th June 1896.—A. Srinivasa Chamberlain, Forest Ranger, 5th Grade, is transferred from South Coimbatore to Tinnevelly—to join on expiry of leave.

26th June 1896.—No. 300.—Mr. R. McIntosh, District Forest Officer, Ganjam, is granted privilege leave for two months, with effect from or after 22nd June 1896, under article 291 of the Civil Service Regulations.

27th June 1896.—N. Swaminatha Iyer, Forest Ranger, Anantpur District, having returned from leave on the forenoon of the 9th June 1896, the unexpired portion of the three months' leave granted to him from the 29th April 1896 in office order No. 104 of 1895-96 is hereby cancelled.

6th July 1896.—M. Shams-ud-din Sahib, Ranger, 4th Grade, Salem District, is temporarily reduced to the 5th Grade.

9th July 1896.—No. 339.

No.	Name and designation of Officer.	From	To	Remarks.
1	Mr. H. A. Latham, Assistant Conservator of Forests, 1st grade.	Madura.	Direction, Southern Circle.	To do duty under the Conservator of Forests.

23rd July 1896.—No. 355.—The privilege leave granted to Mr. R. McIntosh, District Forest Officer, Ganjam, in Notification No. 300, published at page 802 of Part I of the *Fort St. George Gazette*, dated 30th June 1896, is commuted into six months' special leave (private affairs), under Article 348 of the Civil Service Regulations.

3.—Bombay Gazette.

25*th June* 1896.—No. 1900.—Mr. G. R. Duxbury, Assistant Conservator of Forests, was relieved of his duties in the Násik Forest Division by Mr. C. Greatheed, Deputy Conservator of Forests, on the 20th June 1896, in the afternoon.

27*th June* 1896.—No. 5049.—His Excellency the Governor in Council is pleased to make the following appointments on return of Mr. G. K. Betham from leave:—

Mr. W. R. Woodrow to be Divisional Forest Officer, Southern Division of Kánara.

Mr. W. A. Talbot to be Working-Plans Divisional Forest Officer, Southern Circle (Kánara).

Mr. T. R. D. Bell to be Divisional Forest Officer, Thána.

3*rd July* 1896.—No. 5216.—His Excellency the Governor in Council is pleased to direct that the appointment of Mr. T. R. D. Bell to be Divisional Forest Officer, Thána (Government Notification, Revenue Department, No. 5049 of 27th June 1896) should take effect on his return from leave.

14*th July* 1896.—2646.—Mr. A. C. Robinson, Extra Assistant Conservator of Forests, who was allowed privilege leave for three months in Government Resolution No. 4932, dated 24th June 1896, availed himself of the same on the afternoon of 9th July 1896, handing over charge of the Sub-Divisional Office, Colába, to Mr. W. G. Betham, Divisional Forest Officer, Colába.

16*th July* 1896.—No. 5470.—The services of Mr. F. Gleadow, Deputy Conservator of Forests, 3rd Grade, Bombay Presidency, are placed at the disposal of the Government of India in the Department of Revenue and Agriculture (Forests), for employment as Deputy Director of the Imperial Forest School at Dehra Dun.

22*nd July* 1896.—No. 5720.—His Excellency the Governor in Council is pleased to appoint Mr. H. W. Keys to be Deputy Conservator of Forests, 3rd Grade, *vice* Mr. F. Gleadow.

24*th July* 1896.—No. 962.—Mr. T. R. D. Bell, I. F. S., received charge of the office of the Divisional Forest Officer, East Thána, on the 17th July 1896, before office hours.

24*th July* 1896.—No. 5810.—His Excellency the Governor in Council is pleased to appoint Mr. W. D. Wilkins to act as Assistant Settlement Officer, *vice* Mr. A. G. Hudson, pending further orders.

28*th July* 1896.—No. 5878.—Mr. C. M. Hodgson, Assistant Conservator of Forests, 1st Grade, and Divisional Forest Officer, West Thána, is allowed privilege leave of absence for one month.

4.—Bengal Gazette.

The 6*th July* 1896.—No. 2527.—Mr. J. P. Haslett, Extra Assistant Conservator of Forests, 4th grade, is promoted to the 3rd grade of Extra Assistant Conservators, with effect from the 1st July 1896.

10*th July* 1896.—No. 2630.—Consequent on the grant, under Article 343 of the Civil Service Regulations, of leave on medical certificate for nine months to Mr. W. F. Lloyd, Officiating Deputy Conserva-

tor of Forests, 4th grade, with effect from the 7th March 1896, Mr, E. P. Stebbing, Officiating Assistant Conservator of Forests, 1st grade, is appointed to act in the 4th grade of Deputy Conservators, during the absence of Mr. Lloyd on leave, or until further orders.

5.—North-Western Provinces and Oudh Gazette.

1*st July* 1896.—No. 2082—II-349 C.—Mr. F. A. Leete, Assistant Conservator of Forests, in charge of the Bahraich Division of the Oudh Forest Circle, privilege leave for 3 months with effect from the 21st July 1896.

1*st July* 1896.—No. 2083—II-349 C.—Mr. H. G. Billson, Assistant Conservator of Forests, attached to the Kheri Division of the Oudh Forest Circle, to the charge of the Bahraich Division of the same Forest Circle, *vice* Mr. F. A. Leete, granted leave.

6*th July* 1896.—Ns. 2133—II-626 C.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, attached to the Kheri Division of the Oudh Forest Circle, privilege leave for three months with effect from the 1st July 1896.

29*th July* 1896.—2369—II-662 C.—Mr. B. A. Rebsch, Deputy Conservator of Forests, in charge of the Garhwal Division, of the Central Forest Circle, to hold charge of the Kumaon Division of the same Forest Circle, in addition to his other duties, with effect from the 23rd June 1896.

6.—Punjab Gazette.

20*th July* 1896.—No. 360—A. L. No. 11.—*Notification.*—Notification No. 141—A. L. No. 5, dated 11th March 1896, is hereby cancelled.

23*rd July* 1896.—No. 357—A. L. No. 19.—*Notification.*—Mr. C. Somers Smith, Deputy Conservator of Forests, and Khan Bahadur Munshi Fazl Din, Extra Assistant Conservator of Forests, respectively made over and received charge of the Kangra Forests Division on the afternoon of the 4th July 1896.

30*th July* 1896.—No. 363—A. L. No. 20.—On return from the three months' privilege leave granted to him in *Punjab Government Gazette* Notification No. 227—A. L. No. 6, dated 27th April 1896, Mr. G. G. Minniken, Deputy Conservator of Forests, resumed charge of the Bashahr Forest Division, relieving Mr. G. S. Hart, Deputy Conservator of Forests.

30*th July* 1896.—367—A. L. No. 21.—On return from the 27 days' privilege leave granted to him in *Punjab Government Gazette* Notification No. 312—A. L. No. 15, dated 29th June 1896, Mr. A. V. Monro, Deputy Conservator of Forests, resumed charge of the Hazára Forest Division relieving Lála Daulat Ram, Extra Assistant Conservator of Forests, who remained attached to the Division until further orders, on the forenoon of 16th July 1896.

7.—Central Provinces Gazette.

2nd July 1896—No. 2356.—Privilege leave for two months and 29 days, under Article 291 of the Civil Service Regulations, is granted to Dr. E. Dobbs, Deputy Conservator of Forests, Nagpore-Wardha Division, with effect from the 22nd July 1896, or the subsequent date on which he may avail himself of it.

2nd July 1896.—No. 2357.—Mr. C. O. Hanson, Assistant Conservator of Forests, attached to the Chanda Forests Division, is placed in charge of the Nagpur-Wardha Forest Division during the absence of Dr. E. Dobbs, Deputy Conservator of Forests, or until further orders.

23rd July 1896.—No. 2755.—Mr. R. H. E. Thompson returned from the privilege leave granted him by Government of India, Revenue and Agricultural Department, Notification No. 284—80-4 F., dated the 16th April last, and resumed charge of the office of Conservator of Forests, Northern Circle, from Mr. W. P. Thomas, Deputy Conservator of Forests, on the afternoon of the 11th instant.

23rd July 1895.—No. 2756.—On being relieved by Mr. R. H. E. Thompson of the office of Conservator of Forests, Northern Circle Mr. W. P. Thomas, Deputy Conservator of Forests, is reported to the Hoshangabad Forest Division.

On being relieved by Mr. Thomas, Mr. H. E. Bartlett, Assistant Conservator of Forests, will revert to the post of Working-Plans Assistant Hoshangahad.

30th July 1896.—No. 2871.—Dr, E. Dobbs, Deputy Conservator of Forests, Nagpur-Wardha Division, availed himself, on the afternoon of the 22nd instant, of the privilege leave granted him by order No. 2356, dated the 2nd idem, making over charge of his duties to Mr. C. O. Hanson, Officiating Deputy Conservator of Forests.

8.—Burma Gazette.

7th July 1896.—No. 288.—The following transfers are ordered in the Forest Department :—

Mr. G. R. Long, Assistant Conservator of Forests, from Tavoy to the charge of the West Salween Forest Division, *vice* Mr. H. N. Thompson, transferred.

Mr. H. N. Thompson, Assistant Conservator of Forests, from West Salween Forest Division to the charge of the Thaungyin Forest Division, *vice* Mr, Blackwell, who proceeds on leave.

No. 290—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for one month and 25 days is granted to Mr. M Hill, Deputy Conservator of Forests, with effect from the 20th July 1896, or the subsequent date on which he may avail himself of it.

No. 291—During the absence of Mr. Hill, Deputy Conservator of Forests, on privilege leave, Mr. E. A. O'Bryan, Deputy Conser-

vator, of Forests, is placed in charge of the Ruby Mines Forest Division in addition to his present duties

9th July 1896.—No. 292—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 2nd May 1896, consequent on the departure on privilege leave of Mr. H. B. Anthony, Deputy Conservator, 3rd (officiating 2nd) grade :—

Mr. G. Q. Corbett, Deputy Conservator, 4th (officiating 3rd) grade to officiate as Deputy Conservator, 2nd grade.

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

Mr. J. Messer, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade.

(2) With effect from the 4th June 1896, consequent on the increase to the Burma Forest Establishment, sanctioned by the Government of India in letter No. 460-58—4F., dated the 4th June 1996. The lowest substantive appointment in each grade is provisionally substantive during Mr. Slade's deputation to Siam :

Mr. H. Slade, Deputy Conservator, 2nd grade, on deputation to Siam, to be Deputy Conservator, 1st grade (seconded.)

Mr. T. A. Hauxwell, Deputy Conservator, 2nd (officiating 1st) grade to be Deputy Conservator, 1st grade.

Mr. A. Weston, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. J. C. Murray, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade, substantive provisionally.

Mr. G. Q. Corbett, Deputy Conservator, 4th (officiating 2nd) grade, to be Deputy Conservator, 3rd grade, and to continue to officiate in the 2nd grade.

Mr. H. Jackson, Deputy Conservator, 4th Grade, on furlough, to be Deputy Conservator, 3rd grade.

Mr. G. F. R. Blackwell, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, and to officiate as Deputy Conservator, 2nd grade.

Mr. M. Hill, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade.

Mr. C. L. Toussaint, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade.

Mr. H. Carter, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to be Deputy Conservator, 4th grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to be Deputy Conservator, 4th grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. W. F. L. Tottenham, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. H. N. Thompson, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th

grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. W. T. T. McHarg, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. C. W. A. Bruce, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. J. Messer, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. C. R. Dun, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, provisionally substantive.

Mr. H. H. Forteath, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

Mr. G. R. Long, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

Mr. A. M. Burn-Murdoch, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

Mr. S. Carr, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

No. 293.—The following alterations in rank are ordered in the Burma Provincial Forest Service, with effect from the 4th June 1896, consequent on the increase to establishment sanctioned by letter No. 460-58—4F., dated the 4th June 1896, from the Government of India:—

Mr. J. Allmark, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 3rd grade.

Mr. C. Ingram, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. E. M. Buchanan, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. C. W. Allan, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. R. F Lowis, Extra Assistant Conservator, 3rd grade, on deputation to the Andamans, to be Extra Assistant Conservator, 2nd grade.

Mr. P. W. Healy, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade.

No. 204.—The following nominal roll of the Indian and Burma Forest Services shows the place of each officer of the Superior Forest Staff on the Burma list, as affected by the increase to the cadre sanctioned by the Government of India, in letter No. 460-58—4F., dated the 4th June 1896, and is published for general information.

In the case of officers transferred from India the nominal roll shows the place which each of them will hold in Burma, with effect from the date on which he joins :—

BURMA FOREST STAFF.

Indian Service.

Deputy Conservators, 1st grade (5).

1. Mr. M. H. Ferrars.*
2. Mr. J. T. Jellicoe.*
3. Mr. J. Nisbet.*
... *Mr. H. Slade** (on deputation to Siam.)
4. Mr. T. A. Hauxwell.*
5. Mr. A. M. Reuther—provisionally substantive, *vice* Slade.

Deputy Conservators, 2nd grade (5).

... *Mr. A. M. Reuther*
1. Mr. C. W. Palmer.
2. Mr. E. S. Carr.*
3. Mr. H. B. Ward.
4. Mr. A. Weston.
5. Mr. J. C. Murray—provisionally substantive, *vice* Reuther.

Deputy Conservators, 3rd grade (12).

... *Mr. F. C. Murray.*
1. Mr. J. Copeland.
2. Mr. H. B. Anthony.
3. Mr. C. Hobart-Hampden.*
4. Mr. C. E. Muriel*
5. Mr. A. F. Gradon.*
6. Mr. G. Q. Corbett.*
7. Mr. H. Jackson.*
8. *Transferred to Provincial Service.*
9. Mr. G. F. R. Blackwell.
10. Mr. M. Hill.*
11. Mr. C. L. Toussaint,
12. *Vacant*—provisionally substantive.

Deputy Conservators, 4th grade (14).

1. Mr. H. Carter.*
2. Mr. F. J. Branthwaite.*
3. Mr. E. A. O'Bryan.*
4. Mr. W. F. L. Tottenham.*
5. Mr. H. N. Thompson.*
6. Mr. W. H. Lovegrove.*
7. Mr. W. T. T. McHarg.*
8. Mr. C. W. A. Bruce.*
9. *Transferred to Provincial Service.*
10. *Transferred to Provincial Service.*
11. *Transferred to Provincial Service.*
12. Mr. J. Messer.*
13. Mr. C. M. Hodgson.*
14. Mr. C. R. Dun.

Assistant Conservators, 1st grade (8).

1. Mr. H. H. Forteath.*
2. Mr. G. G. R. Long*
3. Mr. A. M. Burn-Murdoch.*
4. Mr. S. Carr.*
5. *Transferred to Provincial Service.*
6. *Vacant.*
7. *Vacant.*
8. *Vacant.*

Assistant Conservators, 2nd grade (6).

1. Mr. C. B. Smales.*
2. Mr. W. F. Perreé.*
3. Mr. A. H. M. Lawson.*
4. Mr. C. W. Doveton.*
5. Mr. A. E. Ross.*
6. *Transferred to Provincial Service.*

Provincial Service.

Extra Deputy Conservators, 1st grade (1).

1. (*Not yet transferred.*)

Extra Deputy Conservators, 2nd grade (2).

1. (*Not yet transferred.*)
2. (*Not yet transferred.*)

Extra Deputy Conservators, 3rd grade (2).

1. Mr. J. Allmark. | 2. (*Not yet transferred.*)

Extra Deputy Conservators, 4th grade (4).

1. Mr. C. Ingram. | 3. J. G. F. Marshall.
2. Mr. E. M. Buchanan. | 4. (*Not yet transferred.*)

Extra Assistant Conservators, 1st grade (5).

1. Mr. C. W. Allan. | 3. *Vacant.*
2. *Vacant.* | 4. *Vacant.*

5. *Vacant.*

Extra Assistant Conservators, 2nd grade (5).

1. Mr. W. J. Lane-Ryan. | 3. Mr. P. W. Healy.
2. Mr. R. F. Lowis. | 4. *Vacant.*

(5) *Vacant.*

Extra Assistant Conservators, 3rd grade (6).

1 Mr. R. N. Kavanagh. | 4 *Vacant.*
2 Mr. F. Ryan. | 5 *Vacant.*
3 Mr. W. A. Hearsey. | 6 *Vacant.*

Extra Assistant Conservators, 4th grade (6).

1 Mr. E. B. Powell. | 4 Mr. D. H. Allan.
2 Mr. C. W. B. Anderson | 5 Mr. F. W. Ryan.
3 Mr. C. S. Rogers | 6 *Vacant.*

No. 10.—With reference to Revenue Department Notification No. 160, dated the 28th April 1896, Mr. J. C. Murray, Deputy Conservator of Forests, made over, and Mr. J. Allmark, Extra Assistant Conservator of Forests, received, charge of the Rangoon Government Timber Depôt and Forest Agency Division on the afternoon of the 7th July 1896.

13*th July* 1896.—No. 300.—Under the provisions of Articles 277 and 291, Civil Service Regulations, privilege leave for 2 months and 26 days is granted to Mr. H. Carter, Deputy Conservator of Forests, with effect from the 6th August 1896, or the subsequent date on which he may avail himself of it.

Under Article 282, Civil Service Regulations, Mr. Carter is permitted to overstay his leave by 15 days.

13*th July* 1896.—No. 301.—Under the provisions of Article 348 of the Civil Service Regulations leave on urgent private affairs for six months is granted to Mr. J. Messer, Deputy Conservator of Forests, with effect from the 15th July 1896 or the subsequent date on which he may avail himself of it.

13*th July* 1896.—No. 302.—Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, is, on return from privilege leave, posted to the Revenue Sub-Division of the Upper Chindwin Forest Division.

13*th July* 1896.—No. 303.—In exercise of the power conferred by Section 2 of the Upper Burma Forest Regulation, 1887, and section 3 of the Burma Forest Act, 1881, the Chief Commissioner appoints Mr. W. J. Ryan, Extra Assistant Conservator of Forests, to discharge the functions of a Forest Officer and to exercise all the powers conferred on Sub-Assistant Conservators by the rules hitherto made under the enactments in question.

13*th July* 1896.—No. 9.—With reference to Notification No. 301, dated the 13th July 1896, Mr. J. Messer, Deputy Conservator

of Forests, made over, and Mr. F. J. Branthwaite, Deputy Conservator of Forests, received, charge of the Working-Plans Division on the afternoon of the 17th July 1896.

13*th July* 1896.—No. 308—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for one month and 26 days is granted to Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

13*th July* 1896.—No.309.—Mr. C. S. Rogers, Extra Assistant Conservator of Forests in charge of the Mong Mit Sub Division, Ruby Mines Division, is appointed to the charge of the Mogok Sub-Division in addition to his other duties during the absence of Mr. Anderson, on privilege leave, or until further orders.

13*th July* 1896.—No. 310.—Under the provisions of Article 277, 291 and 289 (*a*) of the Civil Service Regulations, privilege leave for three months and 15 days is granted to Mr. G. F. R. Blackwell, Deputy Conservator of Forests, with effect from the 1st August 1896, or such date as he may avail himself of it.

13*th July* 1896.—No. 311.—The Chief Commissioner directs that the Magwe Forests Sub-Division, of the Minbu Forest Division, shall be formed into a separate Forest Division, to be called the Magwe Forest Division. The limits of the Magwe Forest Division shall be those of the Magwe district.

17*th July* 1896. -No. 8.—With reference to Notification No. 160, dated the 28th April 1896, Mr. A. Weston, Deputy Conservator of Forests, made over, and Mr. J. Murray, Deputy Conservator of Forests, received, charge of the Kado and Agency Division on the forenoon of the 15th July 1896.

18*th July* 1896.—No. 11.—With reference to Revenue Department Notification No. 301 dated the 13th July 1896, Mr. J. Messer, Deputy Conservator of Forests, availed himself, on the forenoon of the 18th instant, of the leave granted him therein on urgent private affairs.

9.—Assam Gazette.

29*th June* 1895.—No. 4175.—The following Notification by the Government of India is republished :—

No 509—165-2F., *dated Simla, the* 16*th June* 1896.—Mr. E. E. Fernandez, Deputy Conservator of Forests, 1st grade, Assam, reported his arrival at Bombay on the forenoon of the 6th June 1896, on return from the furlough granted him in the Notification of this Department, No. 630F., dated the 15th June 1894. Mr. Fernandez's services are placed temporarily at the disposal of the Chief Commissioner of Ajmere.

29*th June* 1896.—No. 4176G.—Mr. D. P. Copeland, Deputy Conservator of Forests, Lakhimpur Division, is placed on special duty in the Darrang Division, with effect from the 4th July 1896, and is granted privilege leave under article 291 of the Civil Service Regulations, for three months with effect from the 14th idem.

29*th June* 1896.—No. 4177 G.—Mr. F. E. B. Lloyd, Assistant Conservator of Forests, Sibasgar Division, is granted privilege leave, under article 291 of the Civil Service Regulations for two months and 26 days, with effect from the 15th July 1896.

29th June 1896.—No. 4178G.—Mr. H. G. Young, Deputy Conservator of Forests, Kamrup Division, is transferred to the charge of the Lakhimpur Division, and will hold charge of the Sibsagar Division, in addition to his other duties, during the absence on leave of Mr. F. E. B Lloyd, or until further orders.

16th July 1896.—No. 4655G.—The following Notification by the Government of India is republished :

No. 597—58-21F., *dated Simla, the 8th July* 1896.—Mr. A. H. M. Lawson, Assistant Conservator of Forests, 2nd grade, Assam, is transferred to Burma in the interests of the public service.

10—HYDERABAD RESIDENCY GAZETTE.

8th July 1896.—No. 213.—Mr. R. M. Williamson, Officiating Deputy Conservator of Forests, 4th grade, attached to the Ellichpur Forest Division, is granted privilege for 2 months and 28 days, with effect from the 22nd July 1896, or the subsequent date on which he may avail himself of it.

15th July 1896.—No. 220.—Mr. H, Calthrop, Deputy Conservator of Forests, Ellichpur Forest Division, has been granted privilege leave for one month with effect from the date on which he may avail himself of it.

11—MYSORE GAZETTE.

1st July 1896.—No. 11335—Ft. F. 1-96. Mr. P. E. Benson, Sub-Assistant Conservator of Forests, is temporarily posted to the Tumkur district for employment under the District Forest Officer.

6th July 1896.—No. 138—Ft., F. 104-95.—Under article 172 of the Mysore Service Regulations, M. S. A. Bapu Rao, Assistant Conservator of Forests, Hassan district, was granted casual leave of absence for six days from the 2nd to the 7th of June 1896, both days inclusive.

8th July 1896.—No. 305.—Ft. F 64-95.—Under Article 171 of the Mysore Service Regulations, Mr. M. Venkatanaranappa, Assistant Conservator of Forests, Tumkur district, was granted casual leave of absence for three days from the 25th June 1896.

14th July 1896.—No. 535 Ft. F. 91-95.—The one month's leave on medical certificate granted to Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Forest Sub-division, in Notification No. 9316—Ft. F. 91-95, dated 10th April 1896, and which was extended by two months, under Notification No. 9474—Ft. F. 91-95, dated 18th April 1896, is further extended by six weeks.

Mr. Monteiro, Extra Assistant Conservator of Forests, will continue to be in charge of the Shikarpur Sub-division during the absence of Mr. Srinivasa Rao, on leave, or until further orders.

27th July 1896.—No. 944—Ft. F. 27-95.—H. Srinivasa Rao, Ranger, 3rd grade, is appointed to act as Sub-Assistant Conservator of Forests, during the employment of Mr. K. Shamalengar as acting Assistant Conservator of Forests.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

7th August 1896.—No. 756-21-F.—Mr. J. S. Gamble, Conservator of Forests, 1st grade, School Circle, North-Western Provinces and Oudh, and Director of the Imperial Forest School, Dehra Dun, is granted furlough for fifteen months, under Article 340 (*b*) of the Civil Service Regulations, with effect from the 1st August 1896

The following arrangements are made during Mr. Gamble's absence or until further orders :

(*i*) Mr. J. W. Oliver, Conservator, 2nd grade, Eastern Circle Upper Burma, to officiate as Conservator, 1st grade, in charge of the School Circle, and as Director of the Imperial Forest School, with effect from the 1st August 1896.

(*ii*) Mr. F. B Dickinson, Conservator, 3rd grade, Western Circle, Upper Burma—to be in charge of the Pegu and Tenasserim Circles, Lower Burma, with effect from the 21st and the 19th July 1896 respectively, and to officiate in the 2nd grade of Conservators, with effect from the 1st August 1896.

(*iii*) Mr. J. Nisbet, officiating Conservator, 3rd grade, in charge of the Pegu and Tenasserim Circles, to be in charge of the Eastern Circle, Upper Burma, with effect from the 18th July 1896.

(*iv*) Mr. A. Smythies, Deputy Director of the Imperial Forest School, to officiate as Conservator, 3rd grade, in charge of the Western Circle, Upper Burma, with effect from the 14th July 1896.

(*v*) Mr. F. Gleadow, Deputy Conservator, 3rd grade, Bombay, to officiate as Deputy Director of the Imperial Forest School, with effect from the 28th June 1896. From the same date Mr. Smythies reverted to the North-Western Provinces and Oudh List.

11th August 1896.—No. 765—187-4-F.—Mr. A. E. Wild, Conservator of Forests, 2nd grade, Bengal, is granted privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 4th instant.

Mr. E. G Chester, Deputy Conservator, 1st grade, Bengal, is appointed to officiate as Conservator, 3rd grade, in charge of the Bengal Forest Circle during Mr. Wild's absence.

13th August 1896.—No. 776—58-38-F.—With reference to the Bombay Government's Notification No 6024 (Revenue), dated the 1st instant. Mr. C. M. Hodgson, Assistant Conservator of Forests, 1st grade, is transferred to Burma in the interests of the public service.

2.—Madras Gazette.

1st August 1896.—N. S. Anantacharlu, Acting Forest Ranger, 5th Grade, is confirmed in that grade with effect from 14th January 1896,

11*th August* 1886.—No. 403.

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. J. L. MacC. O'Leary ...	Assistant Conservator of Forests, 1st Grade.	Deputy Conservator of Forests, 4th Grade.	Acting ...	*Vice* Mr. C. D. McArthy, acting in the 3rd Grade during Mr. Peake's absence on privilege leave from 6th January 1896 and subsequently to act, *vice* Mr. Jackson on furlough.
2	Mr. W. W. Batchelor ...	Assistant Conservator of Forests, 2nd Grade.	Assistant Conservator of Forests, 1st Grade.	Do. ...	*Vice* No. 1.

12*th August* 1896.—The following promotions and reversions are ordered in the Southern Circle :—

Name.	Present grade.	Grade to which promoted or reverted.	Nature of promotion.	Remarks.
A. F. X. Saldanha ...	Ranger, 5th grade ...	Ranger, 3rd grade ...	Acting	*Vice* Third-grade Ranger Malaya Pillai, suspended from 10th May 1896
C. E. Allen	Deputy Ranger, 1st grade.	Do. 5th grade	Do.	
A. B. Myers	Temporary Ranger, 3rd grade.	Do. do.	Temporary	From date of rejoining from leave.
C. E. Allen	Deputy Ranger, 1st grade, and Acting Ranger, 5th grade.	Do. 3rd grade	...	From date of Ranger Myers' return from leave.
W. B. Jackson ...	Do. do.	Do. 5th grade	Acting	*Vice* Ranger Saldanha. to take effect from 18th Aug. 96.

13*th August*, 1896.—No. 394.—Mr. A. J. A. Porter, District Forest Officer, Trichinopoly, is granted furlough for one year, with effect from 3rd October 1896, under article 340 of the Civil Service Regulations.

13*th August* 1896.—No. 399.

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. H. A. Gass ..	Deputy Conservator of Forests, 2nd grade, and acting in the 1st grade.	Deputy Conservator of Forests, 1st grade.	Permanent ...	
2	Mr. C. E. Brasier ..	Deputy Conservator of Forests, 3rd grade (on furlough).	Deputy Conservator of Forests, 2nd grade.	Do. ...	
3	Mr. E. R. Murray ...	Deputy Conservator of Forests, 4th grade, and acting in the 3rd grade.	Deputy Conservator of Forests, 3rd grade.	Do. ...	With effect from 3rd June '96.
4	Mr. F. Foulkes	Assistant Conservator of Forests, 1st grade, and acting Deputy Conservator, 4th grade.	Deputy Conservator of Forests, 4th grade.	Do. ..	
5	Mr H. F. A. Wood ...	Assistant Conservator of Forests, 2nd grade, and acting in the 1st grade.	Assistant Conservator of Forests 1st grade.	Do. ...	

14*th August* 1896.—Ranger Mr. A. G. Van Haeften granted privilege leave for three months from the date of relief.

3.—Bombay Gazette.

31*st July* 1896.—No. 3098.—Mr. Ganpat Jeywant Rege, who was appointed acting Extra Assistant Conservator of Forests in Government Resolution No. 4940, dated 24th June 1896, reported himself for duty as such on the forenoon of 10th July 1896.

1*st August* 1896.—No. 6024.—The services of Mr. C. M. Hodgson, Assistant Conservator of Forests, 1st Grade, Bombay Presidency, are placed at the disposal of the Government of India in the Department of Revenue and Agriculture (Forests) for employment in Burma, with effect from date of expiry of the privilege leave granted to him in Government Notification No. 5878, dated 28th July 1896.

3*rd August* 1896.—No. 6925.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. W. F. D. Fisher to be Assistant Conservator of Forests, 1st Grade, *vice* Mr. C. M. Hodgson, transferred.

Mr. J. Dodgson to be Assistant Conservator of Forests, 2nd Grade, *vice* Mr. Fisher.

3*rd August*, 1896.—No. 6056.—Mr. L. S. Osmaston, Assistant Conservator of Forests, 1st Grade, is allowed privilege leave of absence for two months and twenty-eight days from 28th August 1896.

5th August 1896.—No. 1077.—Messrs. T. R. D. Bell, I. F. S., and A. G. Edie, I. F. S., respectively delivered over and received charge of the office of the East Thana Division on the 3rd of Augst 1896, before noon.

6th Axgust 1896.—No. 1135.—Mr. C. M. Hodgson, I. F, S., and Mr, T. R. D. Bell, I. F. S., respectively delivered over and received charge of the office of the West Thána Division on 3rd August 1896, before noon.

6th August 1896.—No. 3223.—Messrs W. A. Talbot and W. R. Woodrow, Deputy Conservators of Forests, respectively delivered over and received charge of the Southern Division of Kánara on the forenoon of the 30th July 1896.

6th August, 1896.—No. 3224.—Mr. W. E. Copleston, Assistant Conservator of Forests, delivered over and Mr. W. A. Talbot, Deputy Conservator of Forests, received charge of the Working-Plans Parties Nos. I and II, Southern Circle, on the forenoon of the 1st August 1896.

6th August 1896.—No. 3225.—Messrs. W. R. Woodrow and G. K. Betham, Deputy Conservators of Forests, respectively delivered over and received charge of the Dharwár Division on the 30th of July 1896, before office hours.

21st August 1896.—No. 6610.—Mr. Vaman Ramchandra Govinde, Extra Assistant Conservator of Forests, 1st Grade, and Sub-Divisional Forest Officer, Sátára, is allowed privilege leave of absence for forty days.

4.—Bengal Gazette.

4th August 1896.—No. 3030.—Mr. E. P. Stebbing, Assistant Conservator of Forests, in charge of the Tista Forest Division, is transferred to the charge of the Singhbhum Forest Division.

Mr. F. B. Manson, Deputy Conservator of Forests, in charge of the Darjeeling Forest Division, to hold charge of the Tista Forest Division in addition to his other duties.

28th August 1896.—No. 3477.—Mr. E. G. Chester, Deputy Conservator of Forests, 1st Grade, having been appointed to officiate as Conservator of Forests, Bengal, during the absence, on three months' privilege leave, of Mr. A. F. Wild, or until further orders, the following temporary promotions are hereby made in the Upper Controlling Staff of the Forest Department in Bengal with effect from the 4th August 1896 :—

Mr. F. B. Manson, Deputy Conservator of Forests, 2nd grade, is appointed to officiate in the 1st grade of Deputy Conservators.

Mr. R. L. Heinig, Officiating Deputy Conservator of Forests, 3rd grade, to officiate in the 2nd grade of Deputy Conservators.

Mr. W. H. Lovegrove, Deputy Conservator of Forests, 4th grade (Provisional), to officiate in the 3rd grade of Deputy Conservators.

5.—N. W. P. & Oudh Gazette.

Nil.

6.—PUNJAB GAZETTE.

3rd August 1896.—No 372 / A. L. No. 22. .—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which reverted.	With effect from	Remarks.
Mr. W. P. Thomas ..	Officiating Conservator.	Deputy Conservator, 1st Grade.	July 12th	Conservator on the return of Mr Thomson, Conservator of Forests, from privilege leave.
Mr. J. H. Lace ...	Officiating Deputy Conservator, 1st Grade.	Provisional Dy. Conservator, 2nd Grade.	Do.	
Mr. F. C. Hicks ...	Officiating Dy. Conservator, 2nd Grade.	Officiating Dy. Conservator, 3rd Grade.	Do.	
Mr. A. W. Blunt ...	Officiating Dy. Conservator, 3rd Grade.	Provisional Dy, Conservator, 4th Grade.	Do.	
Mr. A. M. Reuther ...	Officiating Dy. Conservator, 1st Grade.	Deputy Conservator, 2nd Grade.	July 13th.	Consequent on the return of Mr. Minniken from privilege leave.
Mr. H. A Hoghton ...	Officiating Dy. Conservator, 2nd Grade.	Provisionl Dy. Conservator, 3rd Grade.	Do.	
Mr. A. V. Monro ...	Officiating Dy. Conservator, 3rd Grade.	DeputyConservator, 4th Grade.	Do.	
Mr. B. O. Coventry...	Officiating Dy. Conservator, 4th Grade.	Provisional Dy. Conservator, 3rd Grade.	Do.	

13th August 1896.—No. 384 / A. L. No. 23 .—*Leave.*—Mr. C. Somers Smith, officiating Deputy Conservator of Forests, has been granted privilege leave for two months with effect from 5th July 1896.

7.—Central Provinces Gazette.

11*th August* 1896.—No. 3093.—With reference to order No. 2756, dated the 23rd ultimo, Mr. W. P. Thomas, Deputy Conservator of Forests, resumed charge of the office of the Hoshangabad Forest Division on the forenoon of the 14th idem.

Mr. H. E. Bartlett, Assistant Conservator of Forests, reverted to the post of Working-Plans Assistant, Hoshangabad, with effect from the above date.

13*th August* 1896.—No. 3125.—Privilege leave for two months and twenty-eight days, under Article 291 of the Civil Service Regulations, is granted to Mr. M. Muttannah, Extra Deputy Conservator of Forests, in charge of the Forest Division, Nimar, with effect from the 3rd September 1896, or the subsequent date on which he may be permitted to avail himself of it.

No. 3126.—Mr. H.E. Bartlett, Assistant Conservator of Forests and Working-Plans Assistant, Hoshangabad, will hold charge of the Forest Division, Nimar, during the absence of Mr. Muttannah on privilege leave, or until further orders.

8.—Burma Gazette.

25*th July* 1896.—No. 12.—Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, reported his return on the forenoon of the 25th instant from the privilege leave granted him in Revenue Department Notification No. 196 (Forests), dated the 14th May 1896.

No. 13.—With reference to Revenue Department Notification No. 317 (Forests), dated the 21st July 1896, Mr. H. M. Lawson, Assistant Conservator of Forests, reported his arrival in Rangoon on the forenoon of the 13th instant.

30*th July* 1896.—No. 330.—Under the provisions of Article 282 of the Civil Service Regulations, Mr M. Hill, Deputy Conservator of Forests, is permitted to overstay the leave granted to him in this department Notification No. 290, dated the 8th July 1896, by 15 days.

31*st July* 1896.—No. 332.—Mr. F. J. Branthwaite, Deputy Conservator of Forests, is posted to the charge of the Working Plans Division in addition to his other duties during the absence on leave of Mr. Messer, or until further orders.

No. 333.—Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, is transferred from Paungbyin to the charge of the Rangoon Forest Division as a temporary measure.

No. 334.—Mr. A. M. Reuther, Deputy Conservator of Forests, reported his arrival on the 30th July, before noon, and is posted to the charge of the Pyinmana Forest Division.

No. 335.— Mr. S. Carr, officiating Deputy Conservator of Forests, is transferred from Pyinmana to the charge of the Yamethin Subdivision.

1*st August* 1896.—No. 10.—Mr. G.F.R. Blackwell, Deputy Conservator of Forests, made over, and Mr. H. B. Anthony, Deputy Conservator of Forests received, charge of the Attaran and Tenasserim Forest Survey Division on the afternoon of the 1st August 1896.

3rd August 1896.—No. 11.—Mr. H. B. Anthony, Deputy Conservator of Forests, reported his return to duty on the afternoon of the 1st August 1896 from the privilege leave granted to him in Revenue Department Notification No. 107 (Forests), dated the 21st March 1896.

5th August 1896.—No. 337.—Under the provisions of Articles 277, 291, and 282 (*a*) privilege leave for three months and 15 days is granted of Mr. C. S. Rogers, Extra Assistant Conservator of Forests, with effect from the 2nd August 1896, or the subsequent date on which he may avail himself of it.

No. 338.—During the absence on leave of Messrs. Anderson and and Rogers, Extra Assistant Conservator of Forests, or until further orders the Chief Commissioner directs that the Möng Mit Subdivision of the Ruby Mines Division, shall be placed under the charge of the Divisional Forest Officer, Ruby Mines Division.

No. 339.—Mr. E. B. Powell, Extra Assistant Conservator of Forests, is transferred from the Myadaung Subdivision to the charge of the Mogôk Subdivision.

No. 340.—On return from leave, Mr. H. B. Anthony, Deputy Conservator of Forests, is posted to the charge of the Attaran and Thaungyin Forest Divisions.

6th August 1896.—No. 11.—With reference to Revenue Department Notifications Nos. 334 and 335 (Forests), dated the 31st July 1896, Mr. S. Carr, officiating Deputy Conservator of Forests, made over, and Mr. A. M. Reuther, Deputy Conservator of Forests, received charge of the Pyinmana Forest Division on the forenoon of the 4th instant. Mr. Carr resumed charge of the Yamèthin Subdivision from the same date.

7th August 1896.—No. 12.—With reference to Revenue Department Notification No. 310 (Forests), dated the 16th July 1896, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, made over, and Mr. H. B. Anthony, Deputy Conservator of Forests, received, charge of the Thaungyin Division on the afternoon of the 5th August 1896.

No. 13.— Mr. G F. R. Blackwell, Deputy Conservator of Forests, availed himself of the three months and 15 days' privilege leave granted him in Notification No. 310 (Forests), dated the 16th July 1896, on the afternoon of the 5th August 1896.

10th August 1896.—No 14.—Mr. H. Carter, Deputy Conservator of Forests, availed himself on the forenoon of 7th instant of the privilege leave granted him in Revenue Department Notification No. 300 (Forests), dated the 9th July 1896, after having made over charge of the Thayetmyo Division to the Deputy Commissioner on the afternoon of the day previous.

No. 12.—With reference to Revenue Department Notifications Nos. 290 and 291 (Forests), dated the 8th July 1896, and No. 330 (Forests) dated the 30th July 1896, Mr. M. Hill, Deputy Conservator of Forests, made over, and Mr. E. A. O'Bryen, Deputy Conservator of Forests, received charge of the Ruby Mines Forest Division on the afternoon of the 5th August 1896, from which date Mr. M. Hill availed himself of the two months and 10 days' privilege leave granted him in the first and last of the Notifications quoted above.

12th August 1896.—No. 357.—Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, on arrival is appointed to be Extra Deputy Conservator, 4th grade, and is posted to the charge of the Myittha Forest division.

13*th August* 1896.—359.—Under the provisions of Article 391 of the Civil Service Regulations privilege leave for three months is granted to Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, with effect from the 15th August 1896, or the subsequent date on which he may avail himself of it.

14*th August* 1896.—No. 13.—With reference to Revenue Department Notification No. 308 (Forests), dated the 16th July 1896, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, relinquished charge of the Mogôk Forest Subdivision of the Ruby Mines Forest Division, on the forenoon of the 1st instant and availed himself of the privilege leave granted him in the notification quoted above.

No. 363.—Under the provisions of Articles 277, 291 and 282 (*a*) of the Civil Service Regulations, privilege leave for three months and 15 days is granted to Mr. J. Copeland, Deputy Conservator of Forests, with effect from the 19th August, or the subsequent date on which he may avail himself of it.

No. 364.—Mr. S. Carr, officiating Deputy Conservator of Forests, Subdivisional Forest Officer, Yamèthin, is appointed to the charge of the Mandalay Forest Division during the absence of Mr. J. Copeland on privilege leave or until further orders.

No. 14.—Mr. G. R. Long, Assistant Conservator of Forests made over, and Mr. R. Parry, Assistant Commissioner, received, charge of the South Tenasserim division on the afternoon of the 10th August 1896.

15*th August* 1896.—No. 10.—With reference to Revenue Department Notification No. 302 (Forests), dated the 13th July 1896, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, 3rd grade, received charge of the Kindat Revenue Subdivision from Mr. C. W. A. Bruce, Deputy Conservator of Forests, on the forenoon of the 3rd August 1896.

19*th August* 1896.—No. 15.—Mr. H. N. Thompson, officiating Deputy Conservator of Forests, received charge of the West Salween Division on the afternoon of the 15th August 1896.

9.—Assam Gazette.

Nil.

10—Hyderabad Residency Gazette.

Nil.

11—Mysore Gazette.

No. 1832—Ft. F. 91-95—15*th August* 1896.—The leave on medical certificate granted to Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Forest Subdivision, by Notification No. 535—Ft. F. 91-95, dated the 14th July 1896, is extended by two months

2. Mr. Monteiro, Extra Assistant Conservator of Forests, will continue to be in charge of the Skiharpur Forest Subdivision during the absence of Mr. Srinivasa Rao on leave or until further orders.

No. 1838—Ft. F. 104-95,—17*th August* 1896.—Under Section 172 of the Mysore Service Regulations Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Hassan District, has been granted five days' casual leave of absence from the 10th August 1896.

No. 1893—Ft. F. 27-95,—19*th August* 1896. Mr. B. Srinivasa Rao, Assistant Conservator of Forests, 3rd Class, having been granted sick leave from the 12th April 1896, the following temporary promotions are ordered with effect from the said date :—

Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, to act as Assistant Conservator of Forests, 3rd Class.

Mr. M. Srinivasa Rao, Ranger, 2nd grade, to act as Extra Assistant Conservator.

VII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

28th September, 1896.—No. 873.—129-15-F.—On return from the privilege leave granted him in the notification of this Department, No. 468-F., dated the 5th June last, Mr. G. F. Prevost, officiating Conservator of Forests, 3rd grade, resumed charge of the Tenasserim Circle, in Lower Burma, from Mr. F. B. Dickinson, Conservator of the Pegu Circle, with effect from the 9th September 1896.

23rd September 1896.—No. 892—58-39-F.—The following transfers are ordered in the interests of the public service :

(i) Mr. A. M. Reuther, Deputy Conservator of Forests, 2nd grade, Baluchistan—to Burma.

(ii) Mr. E A. Down, Deputy Conservator, 3rd grade, North-Western Provinces and Oudh—to Baluchistan, as Deputy Conservator, 2nd grade, *vice* Mr. Reuther.

25th September 1896—No. 907—218-4-F.—Mr. R. H. E. Thompson, Conservator of Forests, 2nd grade, Northern Circle, Central Provinces, is granted special leave on urgent private affairs, under article 348 of the Civil Service Regulations, with effect from the 12th October 1896, or the subsequent date on which he may be permitted to avail himself of it, and up to and including the 7th December 1896.

2.—Madras Gazette.

28th August 1896.—No. 426.—

Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
Mr. H. A. Latham ...	Assistant Conservator of Forests, 1st Grade.	Deputy Conservator of Forests, 4th Grade.	Acting.	During the absence of Mr. Melntosh on leave, or until further orders.

28th August 1896.—No. 427.—

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. A. B. Jackson ...	Vizagapatam	District Forest Officer, permanent.	
2	Mr. C. DuPré Thornton, Deputy Conservator of Forests, 4th Grade.	Godavari	Do.	
3	Mr. C. Cox, Assistant Conservator of Forests, 1st Grade.	Vizagapatam	Acting District Forest Officer.	During the absence of Mr. A. B. Jackson, or until further orders.
4	Mr. H. A. Latham, Assistant Conservator of Forests, 1st Grade.	Trichinopoly *cum* Tanjore.	Do.	During the absence of Mr. Porter, or until further orders.

1*st September* 1896.—*Reduction.*—T. Narayanaswami Aiyar, Forest Ranger, 4th Grade, Trichinopoly District, to Ranger, 5th Grade, with effect from 1st September 1896.

5*th August* 1896.—*Extension of leave.*—M. Jambunatha Sastri, Forest Ranger, Trichinopoly District, for eight days, in continuation of the one year's leave on medical certificate under article 369 of the Civil Service Regulations notified in page 582 of Part II of the *Fort St. George Gazette*, dated 30th April 1895.

5*th September* 1896.—No. 453.—*Appointments.*

No.	Name and designation of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. W. Carroll, Extra Assistant Conservator of Forests.	Second ...	First ...	Permanent ...	*Vice* Mr. J. G. F. Marshall transferred to Burma.
2	M. R. Ry. T. M. Nallasawmi Naidu, Extra Assistant Conservator of Forests.	Third ...	Second ...	Do.	
3	Mr. H. H. Ward, Extra Assistant Conservator of Forests.	Fourth ...	Third ...	Do.	

22*nd September* 1896.—*Leave.*—K. S. Krishnama Chari, Acting Forest Ranger, Bellary, is granted 45 days' privilege leave from 1st October to 14th November 1896.

22*nd September* 1896.—*Leave.*—P. Ananda Row, Forest Ranger, Ganjam, is granted privilege leave for two months and fifteen days from 9th August 1896

22*nd September* 1896.—*Leave.*—N. S. Veeracharlu, Forest Ranger, Ganjam, is granted privilege leave for two months and twenty-five days from or after the 24th October 1896.

24*th September* 1896.—No. 475.—The privilege leave for one month granted to Mr. F. Foulkes, District Forest Officer, Cuddapah, by the Board of Revenue is extended by month.

Leave.—Ranger E. C. M. Mascurenhas, North Coimbatore, is granted privilege leave for twenty-two days from 8th July 1896

Leave.—Ranger S. Solomon, North Coimbatore Division, is granted furlough for two years from date of relief.

30*th September* 1896.—*Reduction cancelled.*—The reduction of Ranger T. Narayanaswami Aiyyar to 5th Grade, notified at page 1122, Part II. of the *Fort St. George Gazette*, dated 8th September 1896, is cancelled.

3.—Bombay Gazette.

1*st September* 1896.—No. 3380.—Mr. L. S. Osmaston, acting Deputy Conservator of Forests, 4th Grade, doing duty as Assistant to

the Divisional Forest Officer, Working Plans, Central Circle, proceeded on the 27th August 1896, after office hours, on the privilege leave of absence sanctioned in his behalf in Government Resolution No. 6056, dated 3rd August 1896, in the Revenue Department.

5th September 1896.—No. 3479.—Messrs. W. R Gavande, Extra Assistant Conservator of Forests, 1st Grade, and A. D. Wilkins, Deputy Conservator of Forests, 3rd Grade, respectively delivered over and received charge of the Satára Sub-division Forest Office on the 29th August 1896, in the afternoon.

17th September 1896.—No. 7327.—His Excellency the Governor in Council is pleased to direct that Mr. G. R. Duxbury should be attached to the office of the Conservator of Forests, Central Circle, during the ensuing vacation at the College of Science.

29th September 1896.—No. 3832.—In accordance with the orders contained in Government Resolution No. 7327, dated 17th instant in the Revenue Department, Mr. Duxbury reported himself for duty on the 21st current, before office hours.

4.—Bengal Gazette.

7th September 1896.—No. 3594.—Mr. W. M. Green, Deputy Conservator of Forests, in charge of the Direction Division and Personal Assistant to the Conservator of Forests, Bengal, is transferred to the charge of the Kurseong Forest Division.

Mr. A. H. Mee, Extra Assistant Conservator of Forests, is, on being relieved of the charge of the Kurseong Forest Division, attached to the Singhbhum Forest Division.

12th September 1896.—No 3685.—Mr. H. D. D. French, Deputy Conservator of Forests, is on return from furlough, posted to the charge of the Buxa Forest Division.

Mr. W. F. Perree, Assistant Conservator of Forests, on being relieved of the charge of the Buxa Forest Division, will be attached to that Division till his transfer to Burma in November next.

5.—N.-W. P. and Oudh Gazette.

10th September 1896.—No. $\frac{2832}{\text{II}-350\text{ C}}$—Mr. E. T. Haslett, Extra-Assistant Conservator of Forests, attached to the Naini Tál Division of the Central Forest Circle, is granted privilege leave for one month with effect from the 10th September 1896.

16th September 1896.—$\frac{2835}{\text{II}-86\text{ A.}}$—The following temporary pro-

motions and reversions among Forest officers are notified for general information:—

Entry No.	With effect from	Consequent on	Name	From	To
1	26th June, 1896.	Mr. E. A. Down's transfer from these Provinces.	Mr. F. B. Bryant	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd Grade.
			Mr. B. A. Rebsch.	Deputy Conservator 4th Grade.	Officiating Deputy Conservator, 3rd Grade.
			Mr. A. P. Grenfell.	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.
			Mr. H. G. Billson.	Assistant Conservator, 2nd Grade	Officiating Assistant Conservator, 1st Grade.
2	28th June, 1896.	Mr. A. Smythies' deputation as officiating Conservator, Burma.	Mr N. Hearle.	Deputy Conservator, 3rd Grade	Officiating Deputy Conservator, 2nd Grade.
3	1st July, 1896.	Mr. F. B. Bryant's appointment as Assistant Inspector General of Forests, and Superintendent of Working Plans.	Mr. A. G. Hobart-Hampden	Deputy Conservator, 3rd Grade	Officiating Deputy Conservator, 2nd Grade
			Mr. L. Mercer.	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.
			Mr. F. A. Leete.	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.
4	21st July, 1896.	Mr. F. A. Leete's departure on privilege leave.	Mr. J. C Tulloch.	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.

16*th September* 1896.—No. $\frac{2897}{\text{II—665 B}}$—With effect from the 31st March 1896, the date on which Mr. B. B. Osmaston, was appointed as Instructor, Forest School, and in modification of entry No. 1 of Notification No. $\frac{1773}{\text{II--56 A}}$, dated 3rd June 1896.

Mr. F. A. Leete, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator of Forests, 1st grade, provisionally substantive.

No. $\frac{2898}{\text{II-665 B}}$—With effect from the 28th June, 1896, the date from which Mr. A. Smythies reverted to the Imperial list of these Provinces.

Mr. N. Hearle, Deputy Conservator of Forests, 2nd grade, provisional substantive, to revert to Deputy Conservator of Forests, 3rd grade, in the vacancy caused by Mr. E. A. Down's transfer from these Provinces.

No. $\frac{2899}{\text{II-665 B}}$.—With reference the 1st July 1896, *vice* Mr. F. B. Bryant, appointed as Assistant Inspector General of Forests and Superintendent of Working Plans.

Mr. A. G. Hobart-Hampden, Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 3rd Grade, provisionally substantive.

Mr. B. B. Osmaston, Assistant Conservator of Forests, 1st grade (seconded), to be Deputy Conservator of Forests, 4th grade, provisionally substantive (seconded).

Mr. P. H. Clutterbuck, Assistant Conservator of Forests 1st grade, to be Deputy Conservator of Forests, 4th grade, provisionally substantive.

Mr. J. C. Tulloch, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator of Forests, 1st grade, provisionally substantive.

8th September 1896.—No. $\frac{2837}{\text{VI-16B-819}}$—Under section 14 of Act IX of 1882, Mr. P. H. Clutterbuck, Assistant Conservator of Forests, in charge of the Gorakhpur Forest Division is appointed a special Magistrate and is invested with the powers of a Magistrate of the 3rd class within the limits of any Forest division of which he may be in charge for the trial of offences punishable under Act XII 1878.

22nd September 1896.—No. $\frac{2962}{\text{II-835 C}}$—Babu Karuna Nidhan Mukerji, Extra Assistant Conservator of Forests, in charge of the Saharanpur Division of the School Forest Circle, is granted privilege leave for one month with effect from the 19th September 1896.

No. $\frac{2963}{\text{II-835C}}$—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, attached to the Jaunsar Division of the School Forest Circle, to the charge of the Saharanpur Division of the same forest circle *vice* Babu Karuna Nidhan Mukerji, granted leave.

6.—Punjab Gazette.

1st September 1896.—No. 409.—A. L. No. 24. Notification—In No. 372 A. L. 22, dated 3rd August 1896, *for* "Mr. H. A. Hoghton" *read* "Mr. H. Calthrop."

10th September 1896.—No. 419.—Lala Daulat Ram, Extra Assistant Conservator of Forests, Hazara Division, has been granted two months' examination leave with effect from the forenoon of the 7th August 1896.

14th September 1896.—No. 422 A. L. No. 25.—The following changes have taken place in the list of Forest officers in the Associated

Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. B. O. Coventry.	Provisional Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	August 4th.	Consequent on the departure of Mr. Somers Smith on privilege leave on July 5th.
Mr. A. M. Reuther ...	Deputy Conservator of Forests, 2nd Grade.	Officiating Deputy Conservator of Forests, 1st Grade.	August 22nd.	Consequent on the departure of Mr. Dobbs on privilege leave on July 23rd.
Mr. H. Calthrop ...	Deputy Conservator of Forests, 3rd Grade.	Officiating Deputy Conservator of Forests, 2nd Grade.	Ditto.	
Mr, A. V. Monro ..	Deputy Conservator of Forests, 4th Grade.	Officiating Deputy Conservator of Forests, 3rd Grade.	Ditto.	

18*th September* 1896.—No. 432 A. L.—No 26—*Leave.*—The 17 months' furlough granted to Mr. A. L. McIntire, Deputy Conservator of Forests, in Punjab Government Notification No. 77 A. L. No 5, dated 29th January 1895, has been extended by Her Majesty's Secretary of State for India by one month.

28*th September* 1896.—No. 444 A. L. No. 27-*Erratum.*—In notification No. 422 A. L. No. 25, dated 14th September, *for* "Mr. A. M. Reuther," *read* Mr. E. A. Down."

7.—Central Provinces Gazette.

1*st September* 1896.—No. 495.—Privilege leave for one month and twenty-eight days, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. F. S. Barker, Deputy Conservator of Forests, 3rd grade, with effect from the 31st August 1896, or the subsequent date on which he may be permitted to avail himself of it.

16*th September* 1896.—No. 3697.—Privilege for one month and nineteen days, under Article 291 of the Civil Service Regulations, was granted to Mr. A. St. V. Beechey, Assistant Conservator of Forests, attached to the Balaghat Forest Division, with effect from the 21st May 1896.

Order No. 2202, dated the 18th June 1896, is hereby cancelled.

17*th September* 1896.—No. 3699.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, temporarily attached to the Direction Division reported his return from the privilege leave granted him by Order No. 3697, dated the 17th September 1896, on the forenoon of the 16th July 1896.

24th September 1896.—No. 3765.—Consequent on the retirement of Khan Saheb Muhammad Ghouse, Extra-Assistant Conservator of Forests, 1st grade, the following promotion is ordered with effect from the 1st January 1896 :—

Mr. S. G. Pranjpe, Extra-Assistant Conservator of Forests, 2nd grade, to be Extra-Assistant Conservator of Forests, 1st grade.

8.—BURMA GAZETTE.

21st August 1896.—No. II.—With reference to Revenue Department Notification No. 333 (Forests), dated 21st July 1896, Mr. A. M. Burn-Murdoch, officiating Deputy Conservator of Forests, made over, and Mr. C. W. A. Bruce, Deputy Conservator of Forests. received, charge of the Paungbyin subdivision on the afternoon of the 10th August 1896.

25th August 1896.—No. 381.—Mr. A. H. M. Lawson, Assistant Conservator of Forests, is transferred from Rangoon to the head quarters of the Tharrawaddy Forest division.

25th August 1896.—No. 14.—With referrence to Revenue Department Notification No 299 (Forests), dated the 9th July 1896, the Deputy Conservator of Forests, Katha Division, made over, and the Deputy Conservator of Forests, Ruby Mines division, received. charge on the 1st July 1896 of the territories ordered by the Notification quoted above to be transferred from the Katha Forest Division to the Ruby Mines Forest Division.

25th August 1896.—No. 15.—With reference to Revenue Department Notification No. 299 (Forests), dated the 9th July 1896. the Deputy Conservator of Forests, Bhamo Division, made over, and the Deputy Conservator of Forests, Katha division, received, charge on the 21st instant of the territories ordered by the Notification quoted above to be transferred from the Bhamo Forest Division to the Katha Forest Division.

26th August 1896.—No 15.—With reference to Revenue Department Notification No 333 (Forests), dated the 31st July 1896, Mr. W. F. L. Tottenham, Deputy Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests received, charge of the Rangoon Division on the forenoon of the 25th instant.

26th August 1896.—No. 16.—With reference to Revenue Department Notification No. 364 (Forests), dated the 14th instant, Mr. J Copeland, Deputy Conservator of Forests, made over, and Mr. S. Carr, officiating Deputy Conservator of Forests, received, charge of the Mandalay Forest Division on the afternoon of the 25th instant

26th August 1896—No. 17.—With reference to Revenue Department Notification No. 363 (Forests), dated the 14th instant, Mr. J. Copeland, Deputy Conservator of Forests, availed himself of the three months and 15 days' privilege leave granted him in the above quoted notification on the afternoon of the 25th instant.

29th August 1896.—No. 387.—Mr. F. Ryan. Extra Assistant Conservator of Forests, is transferred from the charge of the South Tharrawaddy subdivision to Kado.

No. 388.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, is transferred from Kado to the charge of the South Tharrawaddy subdivision, of the Tharrawaddy Forest Division.

29th August 1896.—No. 389.—Mr. E. B. Powell, Extra Assistant Conservator of Forests, is appointed to the charge of the Mong Mit subdivision, of the Ruby Mines Forest Division, during the absence of Mr. C. S. Rogers, Extra Assistant Conservator of Forests, on privilege leave or until further orders.

29th August 1896.—No. 390.—Maung Yaing, Forest Ranger, is promoted to be an Extra Assistant Conservator of Forests, with effect from the 20th July 1896.

Maung Yaing will continue to hold charge of the Thagaya range.

1st September 1896.—No. 16.—With reference to Revenue Department Notification No. 387 (Forests), dated the 29th August 1896, Mr. F. Ryan, Extra Assistant Conservator of Forests, relinquished charge of the South Tharrawaddy subdivision on the afternoon of the 29th ultimo, Mr. S. A Wood, Ranger, having assumed temporary charge of the duties of that office.

2nd September 1896.—No. 395.—Mr. C. W. Doveton, Assistant Conservator of Forests is posted to the charge of the Yamethin Forest subdivision of the Pyinmana Forest Division, *vice* Mr. S. Carr, Officiating Deputy Conservator of Forests, or until further orders :—

2nd September 1896 —No. 399.—The following temporary postings are ordered in the Forest Department during the absence on privilege leave of Mr. G. F. R. Blackwell, Deputy Conservator of Forests, or until further orders :—

Mr. W. T. T. McHarg, Deputy Conservator Forests, to hold charge of the Magwe Forest Division, in addition to his own duties, with effect from the 1st September 1896.

Mr. D. H. Allan, Extra Assistant Conservator of Forests, to be in charge of the current duties of the Divisional Forest office, Magwe.

2nd September 1896.—No. 400.—Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, is transferred from Kindat to the charge of the Paungbyin subdivision, Upper Chindwin Forest Division.

2nd September 1896.—No. 12.—With reference to Revenue Department Notification No 357 (Forests), dated the 12th August 1896, Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, reported his arrival at Mandalay on the afternoon of the 11th August 1896, and received charge of the Myittha Division from Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, on the afternoon of the 26th August 1896.

7th September 1896.—No. 18.—With reference to Revenue Department Notification No. 359 (Forests), dated the 13th August 1866, Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, made over charge of the Shwegu subdivision to Mr. E. S. Carr, Deputy Conservator of Forests, on afternoon of the 2nd September and availed himself of the three months, privilege leave granted him in the above notification from the same date.

9th September 1896.—No. 19.—With reference to Revenue Department Notification No. 339, dated the 5th August 1896, Mr E. B. Powell, Extra Assistant Conservator of Ferests, assumed charge of the Mogok subdivision on the 11th August 1896, afternoon.

9th September 1896.—No 20.—With reference to Revenue Department Notification No. 337 (Forests), dated the 5th August 1896, and No. 389 (Forests), dated the 29th August 1896, Mr. C. S. Rogers, Extra

Assistant Conservator of Forests, made over, and Mr. E. B. Powell Extra Assistant Conservator of Forests, in addition to his other duties, received, charge of the Mong Mit subdivision on the 11th August 1896, after noon, from which date Mr. C, S. Rogers availed himself of the three months and 15 days' privilege leave granted to him in the first of the notifications quoted above.

14th September 1896.—No. 416.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extention of leave on medical certificate for three months.

No. 417.—In this department Notification No. 380, dated the 24th August 1896, *for* "the Forest Officer in charge of the Thayetmyo Forest Division" *substitute* "the Forest Officer in charge of the Henzada-Thongwa Forest division"

24th September 1896.—No. 434.—C. M. Hodgson, Assistant Conservator of Forests, 1st grade, reported his arrival on the 21st September before noon, and is appointed to be Deputy Conservator, 4th grade.

24th September 1896.—No. 435.—Mr. C. M. Hodgson, Deputy Conservator of Forests, is on arrival posted to the charge of the Attaran Forest Division, in the Tenasserim Circle.

28th September 1896.—No. 13.—With reference to Revenue Department Notification No. 400 (Forests), dated the 3rd September 1896, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. C. W. A. Bruce, Deputy Conservator of Forests, received, charge of the Kindat Revenue station on the forenoon of the 18th September 1896.

24th September 1896.—No. 14.—With reference to Revenue Department Notification No. 400 Forests), dated the 3rd September 1896, Mr. C. W. A. Bruce, Deputy Conservator of Forests, made over, and Mr. R. Kavanagh, Extra Assistant Conservator of Forests, received, charge of the Paungbyin subdivision on the forenoon of the 19th September 1896.

24th September 1896.—No. 440.—The following temporary alterations in rank are ordered in the Forest Department:—

(1) With effect from the 9th July 1896, consequent on the departure on privilege leave of Mr. H. Carter, Deputy Conservator, 4th (officiating 3rd) grade.
Mr. C. R. Dun, Deputy Conservator, 4th grade (provisionally substantive), to officiate as Deputy Conservator, 3rd grade.

2 With effect from the 15th July 1896, consequent on the departure on furlough of Mr. A. Weston, Deputy Conservator, 2nd (officiating 1st) grade:
Mr. J. C. Murray, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.
Mr. M. Hill, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. H. H. Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officicate as Deputy Conservator, 3rd grade.

(3) With effect from the 18th July 1896, consequent on the departure on leave of Mr. J. Messer, Deputy Conservator, 4th (officiating 3rd) grade:
Mr. G. R. Long, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 4th grade) to officiate as Deputy Conservator, 3rd grade.

(4) With effect from the 2nd August 1896, consequent on the return from privilege leave of Mr. Mr. H. B. Anthony :
Mr. M. Hill, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 3rd grade,
Mr. G. R. Long, Assistant Conservator, 1st grade (officiating Depury Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(5) With effect from the 6th August 1896, consequent on the departure on privilege leave of Messrs. G. F. R. Blackwell and M. Hill:
Mr. M. Hill, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. C L. Toussaint, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. G. R. Long, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(6) With effect from the 26th August 1896, consequent on the departure on privilege leave of Mr. J. Copeland.
Mr. H. Carter, Deputy Conservator, 4th (officiating 3rd) grade) to officiate as Deputy Conservator, 2nd grade.
Mr. S. Carr, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 4th grade) to officiate as Deputy Conservator. 3rd grade.

29th September 1896.—No. 15 —With reference to Revenue Department Notifcation No 359, dated the 18th August 1896, Mr. C. B. Smales, Assistant Conservator of Forests. received charge of the Gangaw subdivision from Mr. H. H Forteath. Officiating Deputy Conservator of Forests, Yaw Division, on the forenoon of the 23rd September 1896.

11.—Mysore Gazette.

27th August 1896.—No. 2289 Ft. F. 104-95.—The five days' casual leave of absence granted to Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Hassan District, in Notification No. 1838.—Ft. F. 104-95, dated 17th August 1896, is hereby extended by two days.

1st September 1896.—No. 2338, Ft. F. 90-95 —Under Article 188 of the Mysore Service Regulations Mr. T Abdul Karim, Deputy Conservator of Forests, Mysore District, is granted privilege leave of absence for two months and seven days with effect from the 5th September 1896, or such other date as he may avail himself of the same.

Mr. M. G Rama Rao, Assistant Conservator, Heggaddevankote sub-Divison, will in addition to his duties, be in charge of the office of the Deputy Conservator of Forests during Mr. Abdul Karim's absence on leave or until further orders.

5th September 1896 – No. 2689, Ft. F. 7-96.—Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, Shimoga District, was granted casual leave of absence for five days with effect from 1st August 1896.

5th September 1896.—No. 2692 Ft. F. 1-96.—Under Article 171 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Tumkur District, was granted casual leave of absence for five days with effect from the 24th August 1896.

VIII—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India.

22nd October 1896.—No. 951—218-12-F.—With reference to the notification of this Department No. 907-F., dated the 25th ultimo, Mr. E. E. Fernandez, Deputy Conservator of Forests, 1st grade, Assam, is appointed to officiate as Conservator, 3rd grade, in charge of the Northern Forest Circle, Central Provinces, with effect from the 18th October 1896, and until further orders.

2—Madras Gazette.

6th October 1896. *Promotions.*—(1) G. W. Thompson, Ranger, 4th Grade, Salem District, to act as Ranger, 3rd Grade, sub. *pro tem. vice* C. M. Madurainyagam Pillai.

(2) T. Arumuga Mudaliar, Ranger, 5th Grade, North Arcot District, to act as Ranger, 4th Grade, sub. *pro tem. vice* J. Tapp.

(3) Syed Burhan-ud-din Hussain, Ranger, 5th Grade, Salem District, to act as Ranger, 4th Grade, sub. *pro tem*, *vice* G. W. Thompson.

(4) J. Daly, Acting Ranger, 5th Grade, Trichinopoly District, is confirmed in that grade.

(5) S. Ramaswami Aiyah, Acting Ranger, 5th Grade, Salem District, is confirmed in that grade, (with effect from 3rd October 1896.

(6) C. Raja Gopaul Naidu, Acting Ranger, 5th Grade, Cuddapah District, to continue to act in that grade, sub. *pro tem.*, *vice* T. Arumuga Mudaliar.

(5) V. C. Doraiswami Pillai, Deputy Ranger, 1st Grade, South Arcot, District, to act as Ranger, 5th Grade, sub. *pro tem.*, *vice* Syed Burhan-ud-din Hussain.

The above arrangements (with the exception of No. 5) to have effect from 1st October 1896.

16th October 1896.—*Departmental Examination held in July* 1896—I. Code and Accounts.

The following have passed :—

V. Narayana Iyer	Acting Forester.
T. V. Subbarama Iyer	Do.
C. A. Natesa Iyer	Do.

21st October, 1896.—No. 551.

No.	Name and designation of officer.	Present grade.	Grade to which promoted.	Nature of promotion.
1	M.R. Ry. V. S. Gurunatha Pillai, Sub-Assistant Conservator of Forests (old organization)	Second	Extra Asst. Conservator of Forests, 4th Grade.	Permanent.

21st October 1896.—*Leave.*—K. Rama Row, Forest Ranger, is granted leave on medical certificate for three months from 18th September 1896.

3.—BOMBAY GAZETTE.

13th October 1896.—No. 4091.—Messrs. A. D. Wilkins, Deputy Conservator of Forests, and W. R. Govande, Extra Assistant Conservator, respectively delivered over and received charge of the Satara Sub-Division Forest Office on the 9th October 1896, before noon.

19th October 1896.—No. 5075.—Mr. W. G. Betham, Divisional Forest Officer, Kolaba, handed over and Mr. A. C. Robinson, Extra Assistant Conservator of Forests, received charge of the Sub-Divisional Office, Kolaba, on the forenoon of the 10th October 1896.

23rd October 1896.—No. 8357.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. T. B. Fry to do duty as Professor of Forestry at the College of Science, Poona, from the re-opening of the College, pending further orders, and in addition, to hold charge of the Divisional Forest Office Working Plans, Central Circle, unless relieved before.

Mr. R. S. F. Fagan, on relief, to be Divisional Forest Officer, Working Plans, Central Circle.

Mr. G. R. Duxbury to be Divisional Forest Officer, Nasik, from the date Mr. C. Greatheed proceeds on leave.

No. 8364.—His Excellency the Governor in Council is pleased to appoint Mr. L. S. Osmaston on return from leave to be Divisional Forest Officer, Poona.

24th October 1896.—No. 4307.—Messrs. C. M. Thatte, Huzur Deputy Collector, Nasik, and G. R. Duxbury, Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Nasik, on the 21st October 1896, forenoon.

24th October 1896.—4308—Messrs. C. Greatheed, Deputy Conservator of Forests, and C. M. Thatte, Huzur Deputy Collector, Nasik, respectively delivered over and received charge of the Divisional Forest Office, Nasik, on the 19th October 1896 forenoon.

4.—BENGAL GAZETTE.

Nil.

5.—N.-W. P. AND OUDH GAZETTE.

5th October 1896—No. $\frac{3110}{\text{II-535B}}$—Mr. H. G. Billson, Assistant Conservator of Forests, in charge of the Bahraich Division of the Oudh Forest Circle, on being relieved by Mr. F. A. Leete, to the charge of the Gonda Division of the same Forest Circle.

5th October 1896.—No. $\frac{3111}{\text{II-535 B}}$—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, on return from leave, to the charge of the Bundelkhand Division of the Central Forest Circle.

5th October 1896.—No. $\frac{3115}{\text{II-535 B.}}$ —Mr. E.L Haslett, Extra Assistant Conservator of Forests, Naini Tal Division, on return from leave, to the Garhwal Division of the Central Forest Circle.

5th October 1896.—No. $\frac{3112}{\text{II.—535B.}}$ —Mr. L. Mercer, Deputy Conservator of Forests, on being relieved by Mr. H. G. Billson, from the Gonda Division of the Oudh Forest Circle, to the charge of the Garhwal Division of the Central Forest Circle.

5th October 1896.—No. $\frac{3113}{\text{II.—535B.}}$ —Mr. B. A. Rebsch, Deputy Conservator of Forests, on being relieved by Mr. L. Mercer, from the Garhwal to the Kumaun Division of the Central Forest Circle.

5th October 1896.—No. $\frac{3114}{\text{II—535B.}}$ —Babu Roghu Nath Pathak, Extra Assistant Conservator of Forests, in charge of the Bundelkhand Division of the Central Forest Circle, on being relieved by Mr. J. M. Blanchfield, to be attached to the Kheri Division of the Oudh Forest Circle.

6.—Punjab Gazette.

7th October 1896.—No. $\frac{458}{\text{A. L. No. 28.}}$ —Mr. W. Mayes, Assistant Conservator of Forests, has been transferred from the Bashahr and attached to the Simla Division, where he assumed charge of his duties on the afternoon of the 19th September.

21st October 1896.—No. $\frac{480}{\text{A. L. No. 32.}}$ —Khan Bahadur Munshi Fazal Din, Extra Assistant Conservator of Forests, and Mr. C. Somers Smith, Deputy Conservator of Forests, respectively made over and received charge of the Kangra Forest Division on the afternoon of the 3rd October 1896 consequent on the return of the latter from three months' privilege leave.

7.—Central Provinces Gazette.

12th October 1896.—No. 3947.—Mr. C. M. McCrie, Assistant Conservator of Forests, attached to the Saugor Forest Division as Working-Plans Assistant, is temporarily transferred to the Direction Division, Jubbulpore.

14th October 1896.—No. 3988.—Mr. M. Muttannah, Extra Deputy Conservator of Forests, Nimar, availed himself, on the afternoon of the 5th September 1896, of the privilege leave granted him by Order No. 3125, dated the 13th August 1896, making over charge of the Forest Division, Nimar, to Mr. H. E. Bartlett, Assistant Conservator of Forests.

22nd October 1896.—No. 4101.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, attached to the Direction Division, is appointed to officiate as Forest Divisional Officer, Balaghat, during the absence of Mr. Barker on privilege leave, or until further orders.

22*nd October* 1896.—No. 4102.—Mr. F. S. Barker, Deputy Conservator of Forests, Balaghat Division, availed himself, on the forenoon of the 6th September 1896, of the privilege leave granted him by Order No. 3495, dated the 1st September 1896, making over charge of his duties to Mr. A. St. V. Beechey, Arsistant Conservator of Forests.

27*th October* 1896.—No. 4177.—Mr. W. King, Deputy Conservator of Forests, has been permitted, by Her Majesty's Secretary of State for India, to return to duty within the period of the leave granted him by Order No. 3759, dated the 27th August 1895.

8.—BURMA GAZETTE.

28*th September* 1896.—No. 16.—Mr. H. B. Anthony, Deputy Conservator of Forests, made over, and Mr. C. M. Hodgson, Deputy Conservator of Forests, received, charge of the Ataran Division on the forenoon of the 23rd September 1896.

5*th October* 1896.—No. 446.—The privilege leave granted to Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, in this Department Notification No. 308, dated the 16th July 1896, is commuted to leave on medical certificate for four months.

No. 447.—Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, on return from leave is transferred from Shwegu to the charge of the Mogôk Subdivision, Ruby Mines Division.

No. 448.—On being relieved by Mr. Hearsey, Mr. E. B. Powell, Extra Assistant Conservator of Forests, is transferred from Mogôk to the charge of the Shwegu Subdivision, Bhamo Division, as a temporary measure.

7*th October* 1896.—No. 452.—Mr. A. F. Gradon, Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State to return to duty within the period of his leave.

No. 16.—Maung Shwe Le, Forest Ranger, 3rd grade, in the Upper Chindwin Division, is granted privilege leave for one month, with effect from the 21st September 1896.

No. 456.—Mr. C. B. Smales, Assistant Conservator of Forests, on being relieved of the charge of the Mingin Sub-division, is placed on special duty in the Myittha Forest Division from the 19th August 1896 to the 21st September 1896, both days inclusive. On completion of the special duty he is transferred to the Gangaw subdivision of the Yaw Forest Division.

15*th October* 1896.—No. 17.—With referrence to Notification No. 387 (Forests), dated the 29th August 1896, Mr. F. Ryan, Extra Assistant Conservator of Forests, assumed charge of the Kado subdivision on the forenoon of the 22nd September 1896.

No. 18.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, made over charge of his duties in the Tenasserim Circle on the afternoon on the 10th October 1896.

19*th October* 1896.—No. 18.—With referrence to Revenue Department Notification No. 388 (Forests), dated the 29th August 1896, Mr. P. W. Healy, Extra Assistant Conservator of Forests, assumed charge of the SouthTharrawaddy Sub-division from Mr. S. A. Wood, Forest Ranger, on the forenoon of the 13th instant.

23rd October 1896.—No. 21.—Mr. M. Hill, Deputy Conservator of Forests, reported his return at Katha from the two months and 15 days' privilege leave granted him in Revenue Department Notifications Nos. 290 (Forests), dated the 8th July 1896, and 330 (Forests), dated the 30th July 1896, and assumed charge of the Ruby Mines Forest Division from Mr. E. A. O'Bryen, Deputy Conservator of Forests, on the forenoon of the 16th instant.

27th October 1896.—No. 193.—At a special departmental examination held at Toungoo on the 21st September 1896, Mr. J. W. Ryan, Extra Assistant Conservator of Forests, passed the examination in Burmese by the elementary standard.

28th October 1896.—No. 470.—In supersession of this Department Notification No. 440 (Forests), dated the 28th September 1896, the following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 15th July 1896, consequent on the departure on furlough of Mr. A. Weston, Deputy Conservator, 2nd (officiating 1st) grade :

Mr. J. C. Murray, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr M Hill, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr C R Dun, Deputy Conservator, 4th grade (provisionally substantive), to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 18th July 1896, consequent on the departure on leave of Mr J. Messer, Deputy Conservator, 4th (officiating 3rd) grade.

Mr H H Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(3) With effect from the 2nd August 1896, consequent on the return from privilege leave of Mr H B Anthony.

Mr M Hill, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 3rd grade.

Mr H H Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(4) With effect from the 6th August 1896, consequent on the departure on privilege leave of Messrs G F R Blackwell and M Hill.

Mr M Hill, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr C L Toussaint, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr H H Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

Mr G R Long, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(5) With effect from the 7th August 1896, consequent on the departure on privilege leave of Mr H. Carter, Deputy Conservator, 4th (officiating 3rd) grade.

Mr A M Burn-Murdoch, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(6) With effect from the 26th August 1896, consequent on the departure on privilege leave of Mr J Copeland.

Mr H Carter, Deputy Conservator, 4th (officiating 3rd) grade, to officiate as Deputy Conservator, 2nd grade.

Mr S Carr, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator 3rd grade.

28th October 1896.—No. 471.—Mr P W Healy, Extra Assistant Conservator of Forests, was placed on special duty at Moulmein from the 22nd September to the 8th October 1896.

9.—ASSAM GAZETTE.

7th October 1896.—No. 6558G.—Consequent on the return from furlough of Mr E E Fernandez, Deputy Conservator of Forests, 1st Grade, and of his temporary deputation to Ajmere, the following changes in rank are ordered, with effect from the 17th July 1896 :—

Mr J L Pigot, Officiating Deputy Conservator of Forests, 1st Grade, *seconded*, to be Deputy Conservator of Forests, 1st Grade, sub. *pro tem.*, and to continue *seconded*.

Mr D P Copeland, Officiating Deputy Conservator of Forests, 1st Grade (provisionally substantive 2nd Grade), to be Deputy Conservator of Forests, 1st Grade, sub. *pro tem.*, and to continue as provisionally substantive in the 2nd Grade.

Mr H G Young, Officiating Deputy Conservator of Forests, 2nd Grade (provisionally substantive 3rd Grade), to be Deputy Conservator of Forests, 2nd Grade, sub. *pro tem.*, and to continue as provisionally substantive in the 3rd Grade.

Mr T J Campbell, Officiating Deputy Conservator of Forests 3rd Grade, to be Deputy Conservator of Forests, 3rd Grade, sub. *pro tem.*

Mr A M Long, Officiating Deputy Conservator of Forests, 4th Grade, to be Deputy Conservator of Forests, 4th Grade, sub. *pro tem.*

7th October 1896.—No. 6559G.—Consequent on the reversion to the Assam List of Mr J L Pigot, Deputy Conservator of Forests, 1st Grade, sub. *pro tem.*, *seconded*, and his departure on furlough, the following changes in rank are ordered, with effect from the 1st July 1896 :

Mr D P Copeland, Deputy Conservator of Forests, 1st Grade, sub. *pro tem.* (provisionally substantive 2nd Grade), to revert to his substantive appointment as Deputy Conservator of Forests, 3rd Grade, but to continue as Deputy Conservator of Forests, 1st Grade, sub. *pro tem.*

Mr H G Young, Deputy Conservator of Forests, 2nd Grade, sub. *pro tem.*, provisionally substantive 3rd Grade), to revert to his substantive appointment as Deputy Conservator

of Forests, 4th Grade, but to continue as Deputy Conservator of Forests, 2nd Grade, sub. *pro tem.*

Mr H S Ker-Edie, Deputy Conservator of Forests, 4th Grade, provisionally substantive, to revert to his substantive appointment as Assistant Conservator of Forests, 1st Grade and to be Deputy Conservator of Forests, 4th Grade, sub. *pro tem.*

Mr A M Long, Deputy Conservator of Forests, 4th Grade, sub. *pro tem.*, to officiate as Deputy Conservator of Forests, 4th Grade.

Mr F E B Lloyd, Assistant Conservator of Forests, 1st Grade, provisional substantive, to revert to his substantive appointment as Assistant Conservator of Forests, 2nd Grade, and to be Assistant Conservator of Forests, 1st Grade, sub. *pro tem.*

7th October 1896.—No. 6560G.—Consequent on the departure on privilege leave of Mr D P Copeland, Deputy Conservator of Forests, 1st Grade, sub. *pro tem.*, the following temporary promotions are made, with effect from the 14th July 1896 :—

Mr H G Young, Deputy Conservator of Forests, 2nd Grade, sub. *pro tem.*, to be Deputy Conservator of Forests, 1st Grade, sub *pro tem.*

Mr. T. J. Campbell, Deputy Conservator of Forests, 3rd Grade, sub. *pro term.*, to be Deputy Conservator of Forests, 2nd Grade, sub. *pro term.*

Mr. J. E. Barrett, Deputy Conservator of Forests, 4th Grads, to be Deputy Conservator of Forests, 3rd Grade, sub. *pro tem.*

Mr. A. M. Long, Officiating Deputy Conservator of Forests, 4th Grade, to be Deputy Conservator of Forests 4th Grade, sub. *pro tem.*

Mr. F. E. B. Lloyd, Assistant Conservator of Forests, 1st Grade, sub. *pro tem.*, to officiate as Deputy Conservator of Forests, 4th Grade.

13th October 1896.—No. 6691G.—The following postings and transfers of officers in the Forest Department are ordered :—

Mr. D. P. Copeland, Deputy Conservator of Forests, on return from leave, to the charge of Darrang Forest Division.

Mr. H. S. Ker-Edie, M. A., Deputy Conservator of Forests, on relief by Mr. D. P. Copeland, to the charge of the Kamrup Forest Division.

10.—Hyderabad Residency Gazette.

14th October 1896.—No. 322.—Mr. W.G. J. Peake, Extra Assistant Conservator of Forests, in charge of the Kohana Sub-Division, Ellichpur Division, is appointed to the charge of the Ellichpur Division as a temporary measure, with effect from the afternoon of the 26th September 1896.

No. 323—Mr. M. P. Walsh, an Extra Assistant Commissioner in the Hyderabad Assigned Districts, has been granted furlough for for one year under artiticle 371 of the Civil Service Regulations.

No. 326.—The Resident is pleased to declare that at the departmental examination held at Amraoti on the 21st of September 1896, under section 72 of the Forest Department Code, the undermentioned Forest Officers in the Hyderabad Assigned Districts passed in the subjects specified against their names :—

Mr. L. K. Martin, Extra Assistant Conservator.	Marathi by the higher standard (with credit) and Forest Law
Mr. W. G. J. Peake, Extra Assistant Conservator.	Land Revenue (with credit)

11.—MYSORE GAZETTE.

9th October 1896—No. 3713.—Ft. F. 1-96.—Under Article 171 of of the Mysore Service Regulations. Mr. P. E. Benson, Sub-Assistant Conservator of Forests, attached to the Tumkur District, was granted casual leave of absence on the 16th and 17th September 1896.

29th October 1896—No. 4034—Ft. F. 1-96.—Under Article 171 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, attached to the Tumkur District, was granted casual leave of absence for two days from the 2nd October 1896.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

3rd November 1896.—No. 994—129-18-F.—With reference to the notifications of this Department No. 468-F., dated the 5th June 1896, and No. 873-F., dated the 18th September last, Mr. G. F. Prevost, officiating Conservator of Forests, Tenasserim Circle, Burma, is granted extraordinary leave without pay, under article 366 (*i*) of the Civil Service Regulations, from the 31st August to the 8th September 1896 (both dates inclusive).

20th November 1896.—No. 1031—187-8-F.—On the return of Mr. A. E. Wild, Conservator of Forests, Bengal, from the privilege leave granted him in the notification of this Department No. 765-F., dated the 11th August last, Mr. E. G. Chester, Officiating Conservator, reverted to his substantive appointment of Deputy Conservator, 1st grade, with effect from the 4th instant.

26th November 1896.—No. 1043—226 5-F.—Privilege leave for two months, under Article 291 of the Civil Service Regulations, is granted to Mr F. B. Dickinson, Conservator of Forests, Pegu Circle, Lower Burma, with effect from the 8th November, 1896. Mr. G. F. Prevost, Officiating Conservator, Tenasserim Circle, is placed in charge of the Pegu Circle, in addition to his own duties, during Mr. Dickinson's absence or until further orders.

2—Madras Gazette.

13th November 1896.—No. 495.—M. R. Ry. T. M. Nallaswami Nayudu Garu, Extra Assistant Conservator of Forests, Namakal, is granted privilege leave for one month and twenty-seven days from the 5th instant, or from the date of his availing himself of the same, under article 291 of the Civil Service Regulations.

16th November 1896.—The following promotions are ordered in the Southern Circle :—

Name.	Present grade.	Grade to which promoted.	Nature of promotion.	Remark
N. Armuga Mudaliar ...	Ranger II	Ranger I	Acting ...	During the absence of Mr. Van Haeften on privilege leave for three months from 3rd Sept. 1896.
R. Sundram Pillai	Do. III	Do. II		
M. S. Noronha	Do. IV	Do. III		

17th November 1896.—No. 547.—

No.	Name of officer.	District.	Nature of charge.
1	Mr. J. S. Scot, Asst. Consr. of Forests, Second Grade.	Cuddapah.	To work under the immediate supervision of the District Forest Officer.
2	Mr. C. B. Dawson, Asst. Conservator of Forests, Second Grade.	Tinnevelly.	Do. Do.

28*th November* 1896.—To N. Balajee Singh, Ranger, Nellore District, for two months from 12th November 1896, under article 369 of the Civil Service Regulations.

30*th November* 1896.—M. R. Ry. T. M. Nallaswami Naidu Garu, Extra Assistant Conservator of Forests, is granted, under article 291 of the Civil Service Regulations, privilege leave for seven days in addition to that notified in the *Fort St. George Gazette*, dated 20th October 1896.

3.—Bombay Gazette.

4*th November* 1896.—No. 8692.—The undermentioned officers passed on the 3rd October 1896 the examination in Law prescribed in Rule 4 of the rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department:—

Mr. A. G. Edie, Assistant Conservator of Forests, N. C., Thána.

Mr. J. Dodgson, Assistant Conservator of Forests, N. C. Thána.

2. The names are arranged in the order of merit.

12*th November* 1896.—No. 8972.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. T. R. D. Bell to be Working Plans Divisional Forest Officer, Northern Circle.

Mr. J. Dodgson to be Divisional Forest Officer, Thana.

13*th November* 1896.—No. 5646.—Mr. W. E. Copleston, Assistant Conservator of Forests, who was transferred in Government Resolution No. 7943 of 9th October 1896 as Assistant to the Divisional Forest Officer, Central Division, Kanara, reported himself for duty in that Division on the forenoon of 4th instant.

18*th November* 1896.—No. 2115.—Messrs. T. R. D. Bell, I. F. S., and J. Dodgson, I. F. S., respectively delivered over and received charge of the West Thana Division on the 12th November 1896, in the afternoon.

18*th November* 1896.—No 2116.—Messrs. J. Dodgson, I. F. S., and T. R. D. Bell, I. F. S., respectively delivered over and received charge of the Working Plans Division, N. C., on the 12th November 1896, in the afternoon.

19*th November* 1896.—No. 4982.—Mr. E. M. Hodgson, Assistant Conservator of Forests, Second Grade, reported himself to the undersigned for duty in accordance with the order of Government Resolution No. 8884, dated 10th November 1896, Revenue Department, on the 19th instant before office hours, and is posted to the Poona Division for duty.

24*th November* 1896.—No. 5175.—Mr. E. M. Hodgson, Assistant Conservator of Forests, reported himself for duty to the Divisional Forest Officer, Poona, on the 19th instant, in the afternoon.

4.—Bengal Gazette.

10*th November* 1896.—No. 4353.—The following reversions and postings are ordered, with effect from the 4th November 1896, in consequence of the return of Mr. A. E. Wild, Conservator of Forests, Bengal, from the three months' privilege leave granted him in Government of India Revenue and Agricultural (Forests) Department Notification No. $\frac{765\text{F}}{187\text{-}4}$ dated 11th August 1896:—

Mr. E. G. Chester, Officiating Conservator of Forests, 3rd grade, Bengal, to Deputy Conservator, 1st grade.

Mr. F. B. Manson, Officiating Deputy Conservator, 1st grade, to 2nd grade.

Mr. R. L. Heinig, Officiating Deputy Conservator, 2nd grade, to 3rd grade.

Mr. W. H. Lovegrove, Officiating Deputy Conservator, 3rd grade, to 4th grade (provisionally).

Mr. E. G. Chester is posted to the charge of the Singhbhum Division, and Mr. E P. Stebbing, Officiating Deputy Conservator, 4th grade, to that of the Tista Division.

5.—N.-W. P. and Oudh Gazette.

13*th November* 1896.—No. $\frac{3605}{II-578C.}$ Pandit Sada Nand Gairola, Extra Assistant Conservator of Forests, held charge of the Dehra Dun Division of the School Forest Circle, in addition to the Saharanpur Division, from the 13th to the 29th October 1896, inclusive

13*th November* 1896.—No. $\frac{3606}{II-578C.}$—Pandit Sada Nand Gairola, Extra Assistant Conservator of Forests, on being relieved of the charge of the Saharanpur Division of the School Forest Circle, to the charge of the Dehra Dun Division of the same Forest Circle.

19*th November* 1896.—No. $\frac{3724}{II-851}$—Mr. F. F. R. Channer, who has been appointed to the Forest Department by the Secretary of State for India, and who reported his arrival in Bombay on the 16th November 1896, to be an Assistant Conservator of Forests, 2nd grade, and to be attached to the Kumaun Division of the Central Forest Circle.

19*th November* 1896.—No. $\frac{3725}{II-851}$—Mr. W. A. R. Doxat, who has been appointed to the Forest Department by the Secretary of State for India, and who reported his arrival in Bombay on the 16th November 1896, to be an Assistant Conservator of Forests, 2nd grade, and to be attached to the Garhwal Division of the Central Forest Circle.

25*th November* 1896.—No. $\frac{3804}{II-3.0C.}$—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, attached to the Garhwal Division of the Central Forest Circle, to be attached to the Jaunsar Division of the School Forest Circle.

6.—Punjab Gazette.

2*nd November* 1896.—No. $\frac{485}{A.\ L.\ No.\ 33.}$—Mr. B. O. Coventry, Assistant Conservator of Forests, and Khan Bahadur Munshi Fazl Din, Extra Assistant Conservator of Forests, respectively made over and received charge of the Lahore Forest Division on the afternoon of the 13th October 1896 consequent on the departure of the former on two months and two days' privilege leave.

2*nd November* 1896.—No. $\frac{489}{A.\ L.\ No.\ 34.}$—Mr. B. O. Coventry, Assistant Conservator of Forests, has been granted privilege leave for two months and two days with effect from 14th October 1896.

18*th November* 1896 – No. $\frac{527}{A.\ L.\ No.\ 35.}$—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. E. A. Down	Officiating Dy. Conservator, 1st Grade.	Dy. Con., 2nd Grade.	25th Octr. 1896.	Consequent on the return of Mr. Dobbs from privilege leave.
Mr. A. E. Lowrie ...	Officiating Dy. Conservator, 2nd Grade.	Officiating Dy. Consr., 3rd Grade.	Ditto.	
Mr. A. M. F. Caccia ...	Officiating Dy. Conservator, 3rd Grade.	Officiating Dy. Consr., 4th Grade.	Ditto.	
Mr. A. L. McIntire ...	Dy. Consr. 3rd Grade.	Officiating Dy. Consr., 2nd Garde.	3rd November 1896.	Consequent on the return of Mr. McIntire, from furlough.
Mr. F.C. Hicks	Officiating Dy. Conservator, 2nd Grade.	Officiating Dy. Consr., 3rd Grade.	Ditto.	
Mr. A.W. Blunt	Officiating Dy. Consr., 3rd Grade.	Deputy. Cons., 4th Grade.	Ditto.	
Mr. B. O. Coventry ...	Officiating Dy. Consr., 4th Grade (on privilege leave).	Provisional Asst. Consr., 1st Grade (on privilege leave).	Ditto.	
Mr. H. A. Hoghton ...	Officiating Dy. Consr., 2nd Grade.	Provisional Dy Consr., 3rd Grade.	7th November 1896.	Consequent on the return of Mr. Barker from privilege leave.
Mr. A. V. Monro ...	Officiating Dy. Consr., 3rd Grade.	Dy. Conservator, 4th Grade.	Ditto.	
Mr. C. O. Hanson ...	Officiating Dy Consr., 4th Grade.	Asst. Conservator, 1st Grade.	Ditto.	

13*th November* 1896.—No. 515 —On return from the leave granted him in Punjab Government Notification No. 419, dated 10th September 1896, Lala Daulat Ram is attached to the Kangra Division, where he assumed charge of his duties on the 14th October.

7.—Central Provinces Gazette.

3*rd November* 1896.—No. 4252.—With reference to Order No. 4101, dated the 22nd October 1896, Mr. A. St. V. Beechey, Assistant Conservator of Forests, made over charge of his duties in the Direction Division on the afternoon of the 27th August 1896.

3*rd November* 1896.—No. 4270.—With reference to Revenue and Agricultural Department Notification No. 951—218-12-F., dated the 22nd October 1896, Messrs. R. H. E. Thompson and E. E. Fernandez respectively made over and assumed charge of the office of Conservator of Forests, Northern Circle, Central Provinces, on the afternoon of the 17th October 1896.

12*th November* 1896.—No. 4325.—The furlough without medical certificate for six months, under Article 340 (*b*) of the Civil Service Regulations, granted to Mr. M. Gisborne Smith, Deputy Conservator of Forests, under Revenue Department Order No. 1457, dated the 9th April 1896, is extended, by the Secretary of State for India, up to the 17th December 1896.

12*th November* 1896.—No. 4327.—Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, on being relieved by Dr. Dobbs, Deputy Conservator of Forests, of the charge of Nagpur-Wardha Forest Division, is transferred to Sambalpur as Forest Divisional Officer.

No. 4328.—Mr. J. J. Hobday, Extra-Assistant Conservator of Forests, on being relieved of the charge of the Sambalpur Forest Division, is transferred to Chhindwarra as Forest Divisional Officer.

11*th November* 1896.—No. 4329.—Mr. Ramchandra Krishna, Assistant Conservator of Forests, on being relieved of the charge of the Chhindwarra Forest Division, is transferred to Wardha as Sub-Divisional Officer.

12*th November* 1896.—No. 4330.—Mr A. St. V. Beechey, Assistant Conservator of Forests, on being relieved by Mr. Barker, Deputy Conservator of Forests, of the charge of the Balaghat Forest Division, is transferred to the Chanda Forest Division as Sub-Divisional Officer, Pranhita-Godavery.

17*th November*, 1896.—No 4429.—Privilege leave for one day is granted to Mr. F. S. Barker, Deputy Conservator of Forests, in extension of the privilege leave granted him by Order No. 3495, dated the 1st September 1896.

19*th November* 1896.—No. 4469.—Dr. E. Dobbs, Deputy Conservator of Forests, returned from the two months and twenty-nine days' privilege leave granted him by Order No. 2356, dated the 2nd July 1896 and resumed charge of the Nagpur-Wardha Forest Division from Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, on the forenoon of the 25th ultimo.

23*rd November* 1896.—No. 4615.—Mr. F. S. Barker, Deputy Conservator of Forests, returned from the privilege leave granted him by Order No. 3495, dated the 1st September 1896, and resumed charge of the Balaghat Forest Division from Mr. A. St. V. Beechey, Assistant Conservator of Forests, on the forenoon of the 7th instant.

8.—Burma Gazette.

29*th October* 1896.—No. 19.—Mr. J. N. O. Thurston, Deputy Commissioner, made over and Mr. H. Calthrop, Deputy Conservator of

Forests received, charge of the South Tenasserim division on the forenoon of the 13th October 1896.

2nd November 1896.—No. 472.—Mr. H. Calthrop, Deputy Conservator of Forests, reported his arrival on the afternoon of the 9th October 1896.

Mr. Calthrop is posted to the charge of the South Tenasserim Forest division.

10th November 1896.—No. 482.—Mr. H. B. Ward, Deputy Conservator of Forests, is transferred from Bassein to Rangoon to be Personal Assistant to the Conservators, Pegu and Tenasserim Circles.

No. 483.—Mr. H. N. Thompson, Deputy Conservator of Forests, is transferred, on relief by Mr. H. Carter, from Thayetmyo to Bassein, to take charge of the Bassein-Myaungmya Forest division, *vice* Mr. H. B. Ward, transferred.

11th November 1896.—No. 484.—Mr. C. E. Muriel, Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

12th November 1896.—No. 493.—Mr. A. M. Burn-Murdoch, officiating Deputy Conservator of Forests is posted to the charge of the Toungoo Working Plans Division from the 1st December next.

No. 494.—Mr. H. B. Ward, Deputy Conservator of Forests, is appointed to hold charge of the Rangoon Forest division from the 1st December next, in additon to his duties as Personal Assistant to the Conservators, Pegu and Tenasserim Circles.

14th November 1896.—No. 20,—Mr. S. A. Wood, Forest Ranger, relinquished charge of his duties in the South Tharrawaddy subdivision, of the Tharrawaddy division, on afternoon of the 10th instant.

No. 21.—With reference to Revenue Department Notification No. 483 (Forests), dated the 10th November 1896, Mr. H. N. Thompson, Deputy Conservator of Forests, made over, and Mr. H. Carter, Deputy Conservator of Forests, resumed, charge of the Thayetmyo division on the forenoon of the 12th instant.

30th November, 1896.—No. 22.—With reference to Revenue Department Notification No. 482, (Forests), dated the 10th November 1896, Mr. H. B. Ward, Deputy Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservator of Forests, Pegu Circle, on the afternoon of the 18th instant.

No. 23.—With reference to Revenue Department Notification No. 483 (Forests), dated the 10th instant, Mr. H. B. Warde, Deputy Conservator of Forests, made over and Mr. H. N. Thompson, Deputy Conservator or Forests, assumed charge of the Bassein-Myaungmya division, on the afternoon of the 15th November 1826.

9.—ASSAM GAZETTE.

9th November, 1896.—No. 7268G.—The following Notification by the Government of India, Department of Revenue and Agriculture, is republished :—

No. 351—18-12*F*, *dated Simla, the 22nd October* 1896.—With reference to the notification of this Department No. 907F., dated the 25th ultimo, Mr. E. E. Fernandez, Deputy Conservator of Forests, 1st Grade, Assam, is appointed to officiate as Conservator, 3rd Grade, in charge of the Northern Forest Circle, Central Provinces, with effect from the 18th October, 1896, and until further orders.

10.—HYDERABAD RESIDENCY GAZETTE.

10*th November* 1896.—No. 353.—Mr. R. M. Williamson, Assistant Conservator of Forests, 1st grade, and Deputy Conservator, 4th grade, having returned from privilege leave on the forenoon of the 26th October 1896, is placed in charge of the Ellichpur Forest Division.

11.—MYSORE GAZETTE.

1*st November* 1896.—No. 4107—*Ft. F.* 91-95.—The leave on medical certificate granted to Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Forest sub-division, under Notification No. 1832—Ft. F. 91-95, dated 15th August 1896, is hereby extended by six weeks.

2. Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, and Mr. M. Srinivasa Rao, Ranger, 2nd grade, will continue to act as Assistant Conservator of Forests and Extra Assistant Conservator of Forests, respectively, during the absence of Mr. Srinivasa Rao, on leave or until further orders.

5*th November* 1896.—No. 4251.—*Ft. F.* 1-96.—The five days' casual leave of absence granted to Mr. P. E. Benson, Sub-Assistant Conservator of Forests, attached to the Tumkur district, in Notification No. 2692—Ft. F. 1-96, dated 5th September 1896, is hereby extended by one day, and the whole period treated as casual leave under Article 172 of the Mysore Service Regulations.

11*th November* 1896.—No. 4255—*Ft. F.* 60-95.—Mr. G. E. Ricketts, Assistant Conservator of Forests, having returned to duty on the forenoon of the 26th October from the leave on medical certificate granted to him in Notifications Nos. 172G—Ft. 96 and 5491—Ft. F. 60-95, dated 10th August and 13th December 1895, respectively, the unexpired portion of the leave, *viz.*, twenty-six days, is hereby cancelled.

20*th November* 1896.—No. 4573—*Ft. F.* 119-95.—Under Article 172 of the Mysore Service Regulations Mr. H. Muttappa, Assistant Conservator of Forests, Bangalore district, was granted casual leave of absence for ten days with effect from the 34th October 1896.

26*th November* 1896.—No. 4905—*Ft. F.* 27-85.—In modification of Notification No. 14031—Mis. 2101, dated 22nd June 1896, the Government are pleased to order the following promotions of Forest officers with effect from the 26th October 1896, the date on which Mr. G. E. Ricketts, Assistant Conservator of Forests, returned from the leave granted to him in Notification No. 5491—Ft. F. 60-96, dated 13th December 1895.

1. Mr. B. Hira Singh, Acting Assistant Conservator of Forests, 2nd Class, is confirmed in that class.

2. Mr. C. Appaiya will continue to act as Assistant Conservator of Forests in the 2nd Class during the absence of Mr. Russell on leave or until further orders.

3. Mr. M. G. Rama Rao will continue to act as Assistant Conservator, 3rd Class, *vice* Mr. Appaiya, acting in the 2nd Class.

4. Mr. K. Shamaiengar, Acting Assistant Conservator, 3rd Class, will revert to the grade of Sub-Assistant Conservator of Forests.

STATE FORESTS

OF THE

SPESSART

IN

BAVARIA.

BY

A. M. REUTHER,

DEPUTY CONSERVATOR OF FORESTS.

CALCUTTA:

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.

1896.

STATE FORESTS OF THE SPESSART IN BAVARIA.

A.—General description of the Locality.

1. *Situation.*—In the north-west corner of Bavaria, in a deep bend of the river Main enclosing on the east, south, and west, an extensive, compact forest area of which the central portion is State property.

2. *Configuration, elevation, aspect.*—The Spessart is hilly table-land, 350 to 617 metres above sea-level, intersected by numerous valleys traversed by many streams with very tortuous courses. The surface configuration is very irregular, but not rugged; extensive plateaux are rare, and the forests mainly occupy moderately steep slopes in which every aspect is represented and none conspicuously prevalent.

3. *Climate.*—Somewhat rough; mists, fogs, and hoarfrosts often occur; snowfall is frequently heavy, and snowbreaks among the conifers (especially Scotch pine) are not uncommon, while the pressure of deep snow-masses often prostrates entire thickets of young beech, thereby causing considerable injury. Frosts also are of frequent occurrence, killing the young foliage of the beech and oak, and often destroying the promise of an abundant mast. Nevertheless both oak and beech thrive even at the highest elevations of the Spessart, though the oak, which requires a considerable degree of warmth for its best development, is of somewhat slower growth than in milder climates, and is here outstripped and suppressed by beech of equal age, a circumstance which is of great importance in the present condition and future treatment of the Spessart forests. On the whole, the climate may be described as favourable to forest vegetation.

4. *Rock and Soil.*—On the western edge of the Spessart, on both sides of the valley of the Waldaschaff stream, the rock-formation consists of gneiss (and more rarely of syenite and granite). Where the gneiss is rich in mica and felspar, and consequently decomposes rapidly, it forms a fresh and fairly deep soil very favorable to the growth of deciduous trees and of the Larch, but less suited to the Spruce and Scotch Pine: when growing on this soil, the Spruce is liable to red rot and the Scotch Pine incapable of producing fine straight stems. Gneiss.

The above-mentioned rock-formation and soil are, however, met with only in a very small area on the western limit of the Spessart. Elsewhere, throughout the region covered by the Spessart forests, the pre- Buntsandstein.

vailing rock is exclusively the "Buntsandstein" of the Trias formation. It occurs in horizontal strata, with vertical cleavage, in the shape of massive free-stone blocks, alternating with strata of shaley clay-sandstone. This diversity has an important influence on the quality of the soil: where the sub-stratum consists of the massive variety of Buntsandstein, the soil is poor; where, on the other hand, the soil has been formed by the decomposition of the clay-shale sandstone, it is generally deeper and richer.

Quality of the soil generally.

The soil of the Spessart forests as a whole may be described generally as consisting of a fairly deep, only slightly loamy, sand of little mineral strength, the fertility of which is entirely dependent upon the degree of moisture which it contains. For permanent production of cereals and of other agricultural crops, this soil requires considerable manuring; but where sufficient freshness is maintained by preservation of the forest cover, and specially of the litter and humus, this soil is capable of producing those splendid oak and beech forests met with in the Rothenbuch and Rohrbrunn Circles. Where, on the other hand, the soil is unduly exposed and continually deprived of its covering of humus and litter, it rapidly reaches a degree of deterioration incompatible with fine growth of oak and beech and suited only to conifers.

5. *Area and distribution.*—The Spessart State forests comprise 12 circles covering a large extent of country, but these notes deal only with an area of about 14,000 hectares, distributed as follows:

Rothenbuch Circle	productive forest area	3,447	hectares.
	meadows, fields, etc.	11	„
	unproductive area	29	„
	Total	3,487	„
Rohrbrunn Circle	productive forest area	5,287	„
	meadows, fields, etc.	36	„
	unproductive area	71	„
	Total	5,394	„
Lohrwest Circle		2,670	„
Parts of Waldaschaff and other Circles		2,449	„
	Total	14,000	„

Each of these circles is divided into a number of districts (*e.g.*, Rothenbuch has 5 and Rohrbrunn 17), and subdivided into compartments by rides and natural topographical features.

B.—Rights.

The ownership of the Spessart forests passed in 1814 from the Dukedoms of Mainz and Würzburg to the Crown of Bavaria, but not free of encumbrances. The forests are still burdened with important servitudes and rights of user of long standing, some of which, though injurious and

inconvenient, are essentially necessary to the inhabitants and cannot be extinguished or commuted. They have, however, been regulated by law and are now subject to strict limitation and control. They comprise— Rights inextinguishable.

1. Rights to litter.
2. Wood rights.
3. Pannage.
4. Cattle-pasture.
5. Pasture of geese.

1. Litter.—The right to remove litter is the most noxious. Before it was brought under State control and duly regulated, the removal of litter was practised to excess, especially in the areas adjacent to villages. The result in such cases has been disastrous: in the Hain and Heinrichsthal Circles, for example, the productiveness of the soil has deteriorated from this cause to such an extent that oak and beech could in many parts no longer find sufficient nourishment and have had to be replaced by conifers (Scotch pine and spruce). Disastrous effects of unrestricted litter rights.

The law now provides that—

(*a*) No litter may be removed during the first half of the rotation nor within six years before commencement of regeneration felling.

(*b*) During the remaining portion of the rotation an interval of at least 8 years must elapse between two successive removals of litter from the same area.

(*c*) Subject to the foregoing limitations, litter may be removed only during two fixed days in spring, before the new foliage appears, and during two days in autumn before the fall of the leaves.

2. Wood rights.—The villages of the Spessart are entitled to all dead wood up to 9 centimetres in diameter, which may be removed on every Tuesday and Friday from August to April. They may also remove all branch wood, up to 5 centimetres diameter, yielded by the fellings, within 3 weeks after the felling has been made. In the interests of the right-holders, however, the State is debarred from thinning any wood of deciduous species before 60 years of age, and of conifers before 30 years. This is a serious drawback, as it is inconsistent with adequate tending and improvement of the forest, and prevents the application of suitable measures for minimising damage by snow pressure. Thinnings debarred before 60 years in deciduous and 30 years in coniferous woods.

3. Pannage.—In years when a full oak-mast occurs, the right to pannage is suspended and the pannage sold to the highest bidder on condition that he collects and furnishes a certain quantity of acorns. In ordinary years pannage may be freely exercised, except in an area of 5,800 hectares (comprising parts of the Rohrbrunn, Bischbuch, and Altenbrunn Circles) which is fenced and set aside as a game park.

4 and 5. Cattle-pasture and pasture of geese.—These rights are now unimportant. Cattle-pasture, which formerly was practised very extensively, is now rare and restricted to the grazing of a few cattle in Bomigrain, Seepfad, etc. It is worthy of remark that the extensive pasture-rights which formerly existed have not been extinguished by law, but have gradually ceased spontaneously, as a predilection for stall-feeding gained ground among the people and became general.

Spontaneous cessation of cattle-pasture.

C.—Composition and Description of the Growing Stock.

1. *General.*—The principal species composing the forests of the Spessart are oak (*Q. sessiliflora*), beech, Scotch pine, and spruce. Of these, oak and beech alone are indigenous, and form those splendid forests containing magnificent trees of oak up to 500 years and of beech up to 250 years of age, which have long made the Spessart famous and unique among the forests of Germany. These fine old oak and beech trees occur almost exclusively in the Rothenbuch, Rohrbrunn and Lohrwest Circles, and to some extent also in Waldaschaff. Their preservation is due principally to the former inaccessibility of these forests (which are situated mostly in the interior of the Spessart), and in more recent times to the conservative policy of the administration.

Old oak, 300 to 500 years; beech up to 250 years.

2. *Oak.*—These old oaks above 300 years of age are usually found as standards in old beech forest, but occur occasionally as isolated, spreading, low-branched trees on areas which were ancient pasture-grounds (Hut-Waldungen).

Urwald; oak 450 to 500 years; beech 250 years.

In sub-compartment (*a*) of Urwald (Rohrbrunn) are a number of splendid oak trees 450 to 500 years old, with a mean diameter of 1·3 metres, about 42 metres high, with clean, straight, cylindrical boles of 30 metres up to the lowest branch. Each of these old veterans is surrounded by a cluster of fine oak trees about 250 years old, with a mean diameter of about 82 centimetres, sprung from seed shed by the parent trees; and all are interspersed among splendid beech trees about 250 years of age.

Metzger and Krone; Oak 400 years; Beech 25 0 years.

The famous compartments Metzger and Krone (Rothenbuch), aggregating 46 hectares, are composed of beech forest 250 years old, 40 to 45 metres high, in which are scattered oak standards, 15 per hectare, 400 years old, of equal height with the beech, and with clean, straight boles of 20 metres length on an average. At the last revision of the Working-Plan in 1888, the oak standards were found to contain 10 stères=7·7 cubic metres, per tree, equivalent per hectare to 115·5 cubic metres.

the volume of the beech was	. . .	231	per hectare.
	Total .	346·5	,, ,,

The yield in percentage of timber and firewood was estimated as follows:—

Oak . .	40 per cent.	timber, valued at 100 mk. (£5) per cubic metre.	Percentages of timber and firewood in old oak and beech.
	26 „	large wood, suitable for cask-staves, 20 mk. „	
	34 „	firewood, at 3 mk. per cubic metre.	
Beech . .	30 „	timber, valued at 20 mk. per cubic metre.	
	70 „	firewood, „ „ 5 „ „ „	

At these rates the value of the growing stock per hectare was—

	Mk.
Oak	4,622
Beech	1,900
Total .	6,522

Many of these old oaks, from 400 to 500 years, are now over-mature and decaying, which accounts for the low percentage of timber (40 per cent.) which they yield.

A further instance of finely-grown oak standards occurs in compartment Zuber (Rothenbuch) comprising 45 hectares. The oak here are about 375 years old, with a height from 30 to 39 metres, and diameter up to 92 centimetres, and number 24 per hectare. They are scattered in a beech wood 145 years old, which is now in the regeneration stage. The oak are finely-grown, valuing about 100 mk. per cubic metre of timber. Zuber; oak 375 years; beech 145 years.

Examples of isolated, low-crowned, spreading oaks, 300 to 400 years old, are found in compartments Schleife, Bomigrain, Seepfad, Glasrück, etc., in the Rothenbuch Circle. In Schleife these oaks now occur as standards above beech 71 years old; in Bomigrain, Seepfad, and Glasrück the ground is open and park-like, but acorns have now been dibbled in below the oak trees. All these open, park-like compartments are in process of conversion into full-stocked forest, but about 127 hectares still remain in the Rothenbuch Circle. They were ancient pasture-lands largely used as summer grazing-grounds by the inhabitants in and around the Spessart, and although some scattered oak trees grew on these lands, natural reproduction failed owing to presence year by year of large herds of cattle. During the "Thirty years' War" most of the cattle were killed or carried off, and after close of the war in 1648, natural reproduction began to take place, and on many of these grazing grounds a dense oak forest subsequently sprang up, as in Weisserstein (Rothenbuch), Eichhall (Rohrbrunn), etc. Oak 300 to 400 years, on old pasture grounds. Origin of pure oak forests.

In this last-mentioned compartment an area of 400 hectares is now covered with oak 243 years old, and a few of the parent trees (about 500 years of age) which were originally scattered over the pasture-ground and from which the present stock has sprung, are still standing among them. The oak have here grown up pure, and are fairly well shaped. A young beech underwood now exists on this area below the Eichhall oak 243 years.

oak; on 100 hectares it has sprung up spontaneously, and over the rest of the compartment it has been artificially established. A valuation survey of a sample plot made here in May 1893 gave the following results per hectare:—

Number of oak trees, 243 years old	244
Sectional area	39·4 sq. m.
Mean height	27·5 m.
„ diameter	45 c. m.
Volume (including branch-wood)	597·3 cub. m.

Number of old oaks still in existence

In the interior of the Spessart a very large number of these old oaks are still in existence, *e.g.*, at the last working-plan revision, in 1888, they were found to number 14,000 in Rothenbuch and 102,000 in Rohbrunn alone. Elsewhere, excepting Lohrwest and Waldaschaff, they have long ago disappeared entirely.

Remarkable absence of oak of middle age.

But though the centre of the Spessart possesses this great wealth in old oaks, there is a remarkable absence throughout the Spessart (even in Rothenbuch and Rohrbrunn) of oak trees of middle age, *viz.*, from 100 to 240 years, and a marked prevalence of pure beech woods. The

Cause of absence of oak 100 to 240 years old.

cause is attributable to the mistaken treatment which the forests received in the early stages of systematic forest management, when regeneration was carried out over large areas simultaneously, with a very numerous reserve of standards (as directed in a Forest Order issued in 1729), and to the subsequent practice of prolonging the regeneration period by making only very light cuttings at long intervals, and keeping the cover unduly close and dark. This treatment failed to admit light sufficient for regeneration of the oak, and whenever the latter did succeed in gaining a footing, it was speedily outstripped and suppressed by the faster-growing beech. This error has in more recent times been

Former error in treatment recognised and now avoided.

recognised and avoided, and since some 60 to 70 years the practice has been adopted of establishing the oak in tolerably large groups among the beech in the regeneration period, with timely and adequate thinning and removal of the beech shelter-wood and protection of the young oak against the beech by lopping and cutting back the latter. Young oak of all ages, from 65 years downwards (in some cases up to 100 years, as in Weisserstein, Eichrand and Heister of Rothenbuch, and in Eichhain of Rohrbrunn), are now abundantly represented, and the sylvicultural treatment in force to secure the development of the young oak and their protection against the beech is described in the section "Method of Treatment."

Average height and diameter growth of Spessart oak.

The average height growth of the Spessart oak is about 25 centimetres per annum, and the average width of the annual rings from 1 to 2 millimetres. Heavy oak-masts occur only once in 6 to 10 years.*

* The principal oak masts of the present century occurred in 1822, 1823, 1838, 1842, 1847, 1855, 1857, 1861, 1868, 1875 and 1878.

3. *Beech.*—The species most prevalent in the Spessart is the beech. The occurrence of old woods of this species, up to 250 years, interspersed with oak of equal and greater age, has already been mentioned. The beech also forms extensive pure forests, and as an underwood below oak and conifers, it covers large areas. It grows vigorously wherever the soil has not been too much impoverished by excessive and continuous removal of litter, and easily outstrips the oak. In suitable mixtures of oak and beech its value in stimulating the height-growth of the oak and compelling it to form straight, clean, lofty boles, is very great, and in this respect its office is as marked and as valuable in the Spessart as that which the bamboo performs towards the teak in the forests of Burma. The beech is also of enormous importance in preserving the moisture of the soil by the heavy layers of leaves which it sheds, and by the dense canopy which it preserves up to an advanced age; for the naturally poor soil of the Spessart, in which the permanent maintenance of a sufficient degree of moisture is the most important factor of productiveness, this quality of the beech is invaluable and absolutely indispensable.

Modes of occurrence of beech.

Value of beech in its influence on oak development and on the soil.

4. *Scotch Pine and Spruce.*—The Scotch pine and spruce, though not indigenous in the Spessart, are now widely distributed, having been introduced since the forests passed into possession of the Crown in 1814 (and in some cases even earlier), wherever the soil deterioration had reached a degree inconsistent with further maintenance of oak and beech forest. In some localities, notably in the Heinrichsthal and Hain Circles which had suffered most from unrestricted litter rights, the transformation of the deciduous forest into coniferous woods has already been carried out over large areas. Originally the Scotch pine alone was used for this purpose, but subsequently spruce was introduced with the same object, sometimes pure, but more frequently associated with Scotch pine. These species now often occur as pure coniferous woods, but are frequently underplanted, and sometimes mixed, with beech. They are mostly of an age not exceeding 60 or 70 years, but occasionally occur as somewhat older woods, as, for instance, in compartment Wingert (14, Waldaschaff) which is an excellent Scotch pine wood now 101 years old, with an underwood of beech (partly coppice shoots from the stools of the original stock, and partly planted 30 years ago). This compartment also contains finely-grown spruce and larch trees, 55 years old, with a mean height of 26 metres. Spruce rarely occurs beyond the sapling or young pole stage, but in a few instances, *e.g.*, in the Heinrichsthal Circle, it forms pure forest 80 to 90 years old.

Scotch pine and spruce introduced on deteriorated soil.

Wingert's Scotch Pine 101 years with beech underwood.

5. *Other Species.*—Weymouth pine also occurs up to the young pole stage, usually mixed with beech. In Querbuch (Lohrwest) it has been interplanted with spruce, and is now 32 years old and 16 metres high, though it has suffered from snowbreak.*

Weymouth pine.

* The Weymouth pine is here taller than the spruce of equal age, and as it covers the soil with an abundant deposit of needles, and rapidly drives out bilberry and heather, it is in favour in the Spessart for filling up gaps in beech regeneration.

Silver fir.

The silver fir has of late years been largely planted among young beech crops in the regeneration period, but suffers much from the attacks of deer. It occurs in more advanced stages of growth only in a portion of the Hain Circle.

Larch.

Larch also is rarely found beyond the young pole stage, but has been extensively planted among beech in order to yield valuable timber, as it thrives well in Rothenbuch and other parts of the Spessart, though here and there it suffers greatly from the fungus known as Peziza Willkommii.

Deciduous species, other than oak and beech, of rare occurrence.

Deciduous species other than oak and beech are rare in the Spessart. Hornbeam occasionally replaces beech in depressions exposed to frost; birch, aspen, and willow occur only singly here and there; maple and ash are almost wholly unrepresented, as the soil is evidently insufficiently fresh and fertile for such species.

D.—Method of Treatment.

1. *Aims and objects of management.*—The principal aims and objects which govern the management of the Spessart forests are—

(*a*) the production of large and valuable timber in sustained yield, especially of oak;

(*b*) the reconversion of the coniferous forests into deciduous woods, with a considerable admixture of useful conifers for the production of timber.

Timber industry.

A very extensive timber industry exists in the Spessart, and large and numerous saw-mills in the neighbourhood (*e.g.*, at Hösbach, near the Waldaschaff border) are employed in converting not only the local timber, but even oak and other logs imported from Slavonia, into large scantling for public works, for the local market, and for export. It is found profitable to import foreign timber in the log rather than in scantling, because the import duty on scantling is very high, namely, 20 mk. per cubic metre, but only 1·20 mk. per cubic metre on timber in the rough. To meet the requirements of this thriving industry, large timber in sustained supply is necessary, and to satisfy this demand, the Bavarian Government has preserved those old and often overmature oak trees of Rothenbuch and Rohrbrunn, and has deliberately spread their utilisation over a period far beyond the limit of a purely financial rotation. For instance, the old oak trees standing on 46 hectares, in Metzger and Krone (already described in the Section on Composition of the Growing Stock), were valued in 1888 at 6,522 mk. per hectare or 300,000 mk. in the aggregate. At 3 per cent. the interest on this value would amount to 9,000 mk. per annum; and as these old oaks are already decaying, their further preservation involves direct financial loss.

Reason for preservation of decaying oak beyond financial rotation.

But in order to maintain a sustained supply of large oak timber the utilisation of the reserve of old oaks can be effected only gradually and slowly, in order to obviate the interruption in the future supply which immediate utilisation would necessarily involve in consequence of the absence of oak of middle age (100 to 240 years). It has therefore been arranged to spread the utilisation of this large reserve of old deteriorating oak over a period of 120 years, to allow the existing young stock to acquire sufficiently large dimensions before the old stock is entirely exhausted.

Interruption in supply of large-sized oak timber to be avoided.

In future, oak of such extreme age as those still in existence will probably not be grown to any large extent in the Spessart, as a shorter period will suffice for production of large-sized, sound timber, and will at the same time be more profitable financially.

Such old oak will not be grown in future.

Those deciduous forests which have greatly deteriorated owing to impoverishment of the soil due to long continued and excessive removal of litter, are to be converted into coniferous woods with the preservation, wherever possible, of an admixture of beech to protect and improve the soil. But the object is to reconvert all such woods into deciduous forest, as soon as the soil has been sufficiently improved, maintaining, however, a considerable proportion of suitable conifers for the sake of production of timber. Firewood cannot be profitably sold in the Spessart, and the greatest possible enhancement of the proportion of timber in the outturn is therefore one of the chief aims of the management.

Transformation of deteriorated deciduous forests into coniferous woods.

2. ***Régime; rotation; age classes.***—The High Forest treatment is exclusively in force in the Spessart.

The rotation varies according to the species, *viz.*, where oak forms more than 50 per cent. of the growing stock, the rotation is 300 years. For pure beech, or for beech prevailing in mixtures, it is 120 years; for Scotch pine woods 96 years; and 72 years for spruce.

Rotation varies according to species.

In accordance with general usage throughout Bavaria, the rotation is divided into periods of 24 years each. For beech woods, for instance, 5 periods of 24 years each have been fixed, running from the year 1888 to 2007.

Periods.

Four age classes have been formed. For Rothenbuch, for example, the age classes and corresponding areas are as follows:—

Age classes.

	Hec.
Over 90 years	945
61—90 „	687
31—60 „	920
Up to 30 „	894
Total	3,446
Add—Area of meadows and unproductive land	41
Total	3,487

Pure beech; forest not in favour.

3. *Sylvicultural methods and principles.*—(*a*) *Beech.*—Pure beech woods are not in favour in the Spessart, as they yield only a small percentage of marketable timber, and firewood is not much in demand at remunerative rates. But owing to the valuable qualities of beech in preserving and improving the quality of the soil, it must always continue to play an important rôle in the Spessart forests. Wherever the locality is suitable, beech must form the prevailing species, and must occupy about 50 per cent. of the area in the regeneration coupes. The remaining half of the stocking is intended to be composed in the first place of oak, and in a subordinate proportion of conifers, such as larch, spruce, silver fir, Scotch pine, and Weymouth pine.

Beech to compose 50 per cent. in regeneration.

Full beech-masts occur only at intervals of about 20 years on the average, but partial masts are frequent, and notwithstanding the liability of the young beech to injury by frost and snow pressure, its natural regeneration under shelter-wood is attended with no difficulty in the Spessart; on the contrary, it is usually so abundant, and the seedlings spring up so densely and grow so vigorously, that the difficulty is to prevent the beech from taking entire possession of the ground and ousting the oak and conifers. Its value, however, lies mainly in admixture with oak and conifers and in order to protect these species against the beech, special measures and precautions are resorted to which will be described in dealing with the treatment of mixed woods.

Value of beech in mixtures, and difficulty in keeping it within bounds.

Pure oak forest of advanced age.

(*b*) *Oak.*—The occurrence of oak, of advanced age, as pure forest covering areas of any considerable extent, is not very common in the Spessart, because the beech mostly springs up spontaneously in woods originally composed of pure oak, and where it fails to do so, it is usually introduced artificially as an underwood below the oak. Instances of woods in which the oak has grown up pure to an advanced age have, however, already been mentioned, such as Eichhall in Rohrbrunn, where the oak grew up pure to an age upwards of 240 years. But the individual stems here are not as straight and clean as those of oak which have grown up in association with beech, such as those of Zuber and of Metzger and Krone.

Oak raised in association with beech better than pure-grown.

Young woods of pure oak.

Young woods of pure oak, mostly raised artificially, are, however, largely represented. Like Eichhall, they occur usually on old pasture grounds. Compartment Dreieck (Rohrbrunn) affords an instance of pure oak forest covering upwards of 200 hectares. It originated from acorns dibbled into the ground below the old oak trees which were originally scattered over the area; these were subsequently removed, and the whole area is now occupied by an exceedingly dense crop of

pure oak, 32 years old, with a mean height of 6½ metres. Eichhain (Rohrbrunn) also contains an oak wood which has grown up pure to an age of 90 years, and was then underplanted with beech. The stems are, however, in this case also inferior in height, girth, and shape to those of the same age which have had the advantage of earlier association with the beech, such as Weisserstein, a pure oak forest of the same age, but underplanted with beech at the age of 50 years. Pure oak usually grows up very well to an age of 40 to 50 years, but then begins to thin out rapidly, epicormic branches and lichens appear, and the soil becomes unduly exposed and occupied by bilberry and other weeds. Sometimes this occurs at an age even less than 40 years, *e.g.*, in compartment Schlaglein (Lohrwest), where these results have become apparent at an age of only 32 years.

Eichhain; pure oak 90 years old.

Pure oak woods thin out at age of 40 to 50 years.

In the Spessart these defects in the development of pure oak forest have led to the systematic introduction of beech underwood below the oak, usually at an age of about 50 years or a little less, and the oak is now invariably associated with beech, mixed with the latter species sometimes singly or in strips, but usually in groups.

Defects of pure oak woods have now led to systematic association with beech.

(*c*) *Mixture of oak and beech*—(*1*) *by single trees, of uniform age.*—In consequence of the far more rapid growth of the beech as compared with the oak in the Spessart, suitable mixtures of these species cannot be successfully maintained with the ordinary system of natural regeneration proceeding by preparatory, seeding, and final fellings. For with equal or nearly equal aged mixtures the beech quickly outstrips and suppresses the oak; and in large areas where the species are mixed by single trees of uniform age, adequate protection of the oak against the beech by lopping, or cutting back, the latter becomes impracticable owing to the expense, difficulty of control, etc. But in consequence of the considerable degree of light demanded by the oak, complete freedom of its crown in all stages of growth is essentially necessary—a condition which it fails to secure, without artificial aid, in regeneration coupes carried out on the ordinary system in mixed forests of oak and beech in the Spessart. The disastrous results of withholding a necessary degree of light and of leaving the oak to struggle unaided against the beech in the regeneration coupes, is sufficiently exemplified by the complete absence from the Spessart forests of oaks of middle age.

Mixture of oak and beech not maintainable with natural regeneration only.

Although the oak, if sufficiently favoured, derives immense benefit from mixture with the beech by single trees of uniform age, such mixtures are necessarily rare in the Spessart; and where they do occur, they cover comparatively small areas in which the oak has invariably had the advantage of careful protection against the beech by topping off, lopping, or cutting out the latter. In Sülzhöh (Rothenbuch) is an

Occurrence of oak and beech mixture, by single trees of uniform age, is rare.

Silkhöh; oak and beech, 51 years, mixed singly.

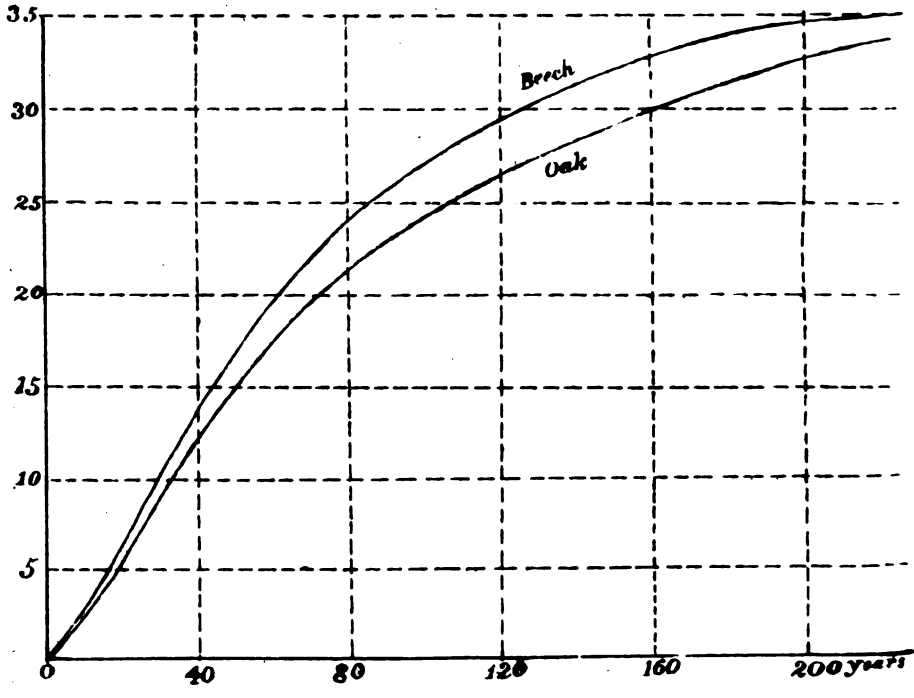
example of an oak and beech mixture by single trees of uniform age, *viz.*, 51 years. The stocking is dense, and the oak are finely grown, with their crowns well above the surrounding beech which have been lopped and cut back whenever threatening to suppress the oak. Another interesting example of oak and beech mixture by single trees of uniform age occurs in Wasen (Lohrwest). Here an area of 40 hectares is covered with oak and beech 45 years old, said to have been regenerated naturally. The oak are taller than the beech, because the latter were formerly lopped and topped off a good deal by wood-cutters, who used the beech-shoots as withies. The height of the oak is now 12 to 14 metres, the stems being clean and straight, and the soil thickly covered with humus and beech litter.

Wasen; oak and beech, 45 years, mixed singly.

Instances such as these are, however, rare and exceptional, and in mixtures of oak and beech by single trees, in the Spessart, the oak nearly always have a considerable start in point of age.

Comparison of rates of height-growth of oak and beech.

The comparative rates of height-growth of the oak and beech in the Spessart, as determined by numerous measurements made by Dr. Karl Gayer (Forestry Professor at Munich) in the Rothenbuch and Rohrbrunn Circles, are apparent from the following graphic representation :—



(2) Mixture of Oak and Beech.

(2) *By single trees, the two species differing in age.*

Origin of oak and beech mixture of different age.

Such mixtures, where the age of the two associated species differs, have in the Spessart always originated either in oak at first grown pure, into which beech from the surrounding forest has intruded spontaneously after the oak had begun to thin out, or in which an underwood of beech has been established artificially. This operation is usually carried out when the oak wood begins to thin out, which generally occurs in the Spessart between 40 and 50 years of age. The proper time for introduction of the beech is indicated by the appearance, here and there, of tender grasses on the ground. If the underplanting of beech is carried out at this time, no thinning of the oak is usually necessary beyond removal of suppressed and weakly trees; if, on the other hand, the underplanting is unduly delayed, bilberries and other weeds take possession of the ground, and as the cover overhead continues to thin out, epicorms appear on the oak, and the trees fail to gain the full advantage of having their stems closely surrounded by a dense underwood and the soil continually covered with thick layers of beech leaves from a sufficiently early stage of growth.

Appropriate time for underplanting oak with beech.

Effect of delay in underplanting.

In such mixtures, by single trees, where the oak has a start of 40 to 50 years, it is usually able to maintain its crown above the beech during the rest of the rotation, the dense canopy of the rapidly growing beech stimulating it to develop tall, clean stems, while the beech keeps the soil covered and enriches it with the abundant foliage which it sheds, at the same time preserving the moisture which, in the Spessart, is an element of such extreme importance. Oak grown under such conditions reaches a degree of development little short of, if not quite equal to, that of oak associated with beech from the outset, while it has the immense advantage of being independent, or nearly so, of artificial protection against suppression by the beech. Where suppression is nevertheless threatened, and where the beech presses the oak so closely as to prevent the latter from developing a sufficiently broad crown, the practice obtains of ringing, lopping, and topping off the beech according to necessity.

Advantage of underplanting oak with beech.

Examples of splendid oak grown under such conditions are furnished by the Urwald, Metzger and Krone, Zuber, etc. (previously described), where the oak manifestly grew up pure at first, and were afterwards brought into association with the beech by spontaneous intrusion of the latter. Extensive areas in the Spessart are now covered with young oak forest underplanted with beech; a famous example exists in compartment Weisserstein (Rothenbuch), where the oak wood, now 100 years old, grew up pure till the age of about 52 years, and was then

Examples of fine oak grown in association with beech of less age.

Weisserstein oak, 100 years old, underplanted with beech.

thinned and an underwood of beech established by sowing and planting. A valuation survey of a sample plot, made in May 1893, yielded the following results, per hectare :—

Number of oak trees, 100 years old	612
Sectional area	30·8 sq. m.
Mean height	24 m.
„ diameter	24 c. m.
Volume (including branches)	386·2 cub. m.

Up to the year 1890, thinnings of this wood yielded 154 cubic metres per hectare. The beech underwood, about 45 years old, is now 6 metres high, containing about 4,800 stems per hectare, with a mean diameter of 3 centimetres.

Röhrweg; oak 63 years old, underplanted with beech.

Numerous examples of such mixtures in young woods occur in the Spessart, *e.g.*, Haidlücke and Röhrweg (Rothenbuch), covered with pure oak (with a few beech interspersed), 63 years old, underplanted with beech at the age of 42 years, the oak being splendidly grown with a mean height 16 to 17 metres. These young woods promise to equal Weisserstein in excellence.

Cost and method of establishing beech underwood.

The operation of establishing beech underwoods below the oak is very cheap and expeditious, the cost being only 10 to 15 marks per hectare; nurseries are not required, seedlings being taken from neighbouring regeneration coupes (which are usually carpeted with seedlings in great profusion) and planted out with a planting hatchet at the age of one year.

3. *System of regeneration, and mixture of oak in groups among beech of equal age.*—As already noted, the prevailing Species in the Spessart is the beech, which predominates largely above all the other species occurring in that locality. It is regenerated naturally under shelterwood in the usual manner by preparatory, seeding, and final cuttings.

Beech regeneration, and special measures for maintaining oak.

As, however, in the regeneration coupes (even in woods containing a large proportion of oak) the beech soon gains entire possession of the ground and ousts the oak, special measures for maintaining and increasing the proportion of oak in the stocking have been adopted since the last 60 years, or more, and various methods of attaining that object have been tried.

Oak in very small groups.

One of the earliest methods was to introduce the oak in very small groups, one-tenth of a hectare in extent, or even less (more rarely as much as half a hectare), by sowing acorns and sometimes by planting oak seedlings among the beech in the regeneration coupes. The patches were sown, or planted, either just before the regeneration of the beech took place, or, if the beech seedlings had already taken possession of the ground, they were removed before introduction of the oak (for instance

in Vierthor and Eichhain (*a*), Rothenbuch). This method did not prove very successful; the oak were still suppressed by the beech, and the smaller the groups the greater the liability to suppression, even when the groups were isolated by encircling them with cleared paths one or two metres wide, as was usually done. Lopping and cutting back of the beech had to be largely resorted to—a troublesome operation, and difficult to carry out, as these small oak patches were scattered here and there and surrounded by beech thickets. Many examples of this defect in the system occur, *e.g.*, in Schneuse (Rothenbuch) small oak groups were established in 1855 in a beech wood, but although they are now 38 years old and the surrounding beech have been repeatedly lopped and cut back, they are still in danger of suppression, although of the same age as the beech.

Defects in system of groups with very small area.

Schneuse; small oak groups, 38 years old, still in need of protection against beech.

Subsequently the plan was adopted of establishing oak by sowing in long strips, 6 to 8 metres wide, alternating with beech strips naturally regenerated; but this method is too rigid, and has the inherent disadvantage of assigning to the oak localities and soils which are frequently not the best suited for its development, instead of securing for it only the most favourable conditions of soil and locality. In Querbuch (Lohrwest), and elsewhere, such strips are found to contain soil often varying in quality from place to place, even in the same strip, and the oak are therefore less well developed than when grown on the best soil.

Oak in strips alternating with beech, and disadvantage of this system.

These drawbacks in the afore-mentioned methods have led to introduction, in 1866, of the system of establishing the oak in large groups, from 1 to 10 hectares in extent (even up to 15 hectares, as for instance in the Forsthaus compartment of Lohrwest) in localities carefully selected as being the most favourable to the oak. One of the best and safest indications as to the depth and general suitability of the soil for locating such groups is found in the height-growth of the beech;—where this is most developed, the soil is sure to be sufficiently deep and suitable for oak. Such places, of sufficient extent,* are carefully searched out, and in the regeneration period of the beech they are reserved for establishment of large oak groups by dibbling acorns into the ground, or sowing them broadcast, under the beech shelterwood. In the early stages these large oak groups at first grow up pure, surrounded by dense beech wood of equal age, but quite safe from suppression; when the oak in these groups begin to thin out, at 40 to 50 years of age, they are underplanted with beech, and will ultimately develop into large groups of oak intimately associated with

Oak in large groups among beech.

Indication and selection of soil best suited for oak groups.

Oak in large groups underplanted with beech.

* Every oak group not less than one hectare in extent is treated as a separate sub-compartment. This is useful, as without a good 'parcellaire' practical forest operations, such as thinning, tending, etc., cannot be readily located, nor continuity of paper record properly secured.

beech under conditions exceedingly favourable to the best development of the oak. This system of establishing oak among beech is one of the most important and characteristic features of the modern treatment of oak and beech mixtures in the Spessart.

Only acorns of Spessart oak used in sowing.

In these oak groups no acorns are sown except such as have been collected from the Spessart oaks, all of which are of the sessile variety. This precaution is taken to avoid chance admixture of the *Q. pedunculata*, which requires fresher soil and a greater degree of warmth than the Spessart possesses.

Comparative value of Scotch pine and spruce in restoring deteriorated forest of oak and beech.

(*d*) *Scotch pine and spruce.*—Deteriorated beech woods, such as those in the Heinrichsthal and also in the Hain, Sailauf, and Waldaschaff Circles, are in process of conversion into coniferous woods, which are less exacting in their demands on the soil. Scotch pine was formerly used almost exclusively for this purpose; but as it does not thrive very well at the higher elevations, and is exceedingly liable to snowbreak, it has latterly been associated, or replaced, to a great extent by spruce, especially where the soil is not of the very poorest description. Spruce protects the soil better than the Scotch pine (the cover of which grows thin at a comparatively early age), and also produces in the Spessart a larger proportion of valuable timber than the Scotch pine. In these conversions, a considerable admixture of beech is always sought to be maintained not only for protection of the soil, but also to guard against the manifold dangers to which pure coniferous woods are exposed through snowbreak, storms, and insects. Wherever the soil permits, these coniferous woods are underplanted with beech.

Admixture of beech in the coniferous woods.

The spruce is also largely used to fill up gaps in beech regeneration coupes of woods of the best quality growing on undeteriorated soil, for the purpose of increasing the proportion of timber. Scotch pine, also, is sometimes used in such woods of the best class, to replace beech (or to protect spruce) in frost-holes (as in a portion of Scheuse, Rothenbuch).

(*e*) *Other species.*—To increase the proportion of timber, larch silver fir and Weymouth pine are also extensively planted in small groups in the beech regeneration coupes. Formerly they were all located, like the spruce, in gaps where the beech regeneration had failed, but the soil in such places being usually the poorest, the larch has there been exposed in an enhanced degree to canker (caused by the fungus Peziza Willkommii). The best places are now usually selected for the larch, which is planted

Introduction of various conifers in beech regeneration coupes.

among the beech either singly or in small groups. It is the most valuable species after oak. Where the locality is suitable, it grows rapidly (about half a metre per annum), but frequently requires protection against the beech in the early stages of growth.

Silver fir is much exposed to injury by deer, and the young plants are usually protected (not very successfully) by smearing them with a preparation of tar. It is sometimes introduced under beech shelterwood by sowing;—in such cases shallow trenches are dug, and the seed sown on the banks of excavated earth (as in Birkrain, Lohrwest) in order to protect the seedlings against being covered by beech leaves, a danger to which they are very liable to succumb.

E.—Yield.

The old oak reserve, the utilisation of which is to be spread over 120 years (beginning with 1888), yields the following annual outturn :—

Circle.	Number of old oak existing in 1888.	Number of old oak felled annually.	Annual yield, in stères.	Remarks.
Rothenbuch . . .	14,000	310	3,000	In Waldaschaff, 60 old oak are cut annually.
Rohrbrunn . . .	102,000	800	8,800	
Lohrwest . . .	70,000	300	3,000	
Total .	186,000	1,410	*14,800	

* 14,800 stères × ·77 = 11,396 cubic metres.

The total annual yield of Rothenbuch, Rohrbrunn, and Lohrwest, according to the latest revision of the Working-plan prepared in 1888, is as follows :—

Circle.	Area in hectares.	Estimated yield, in stères.					Total yield per hectare.	
		Final.	Intermediate.	Total.	Proportion in total yield.		In stères.	Equivalent in cubic metres.
					Oak.	Beech.		
Rothenbuch . .	3,487	13,700	2,500	16,200	3,000	13,200	4·6	3·6
Rohrbrunn . .	5,394	33,000	5,500	38,500	8,800	29,700	7·16	5·5
Lohrwest . .	2,670	12,400	1,800	14,200	3,000	11,200	5·32	4·1
Total .	11,551	59,100	9,800	68,900	14,800	54,100	5·96	4·6

The following is the estimated yield of old oak, in Rothenbuch and Rohrbrunn, corresponding to each of the five rotation-periods, of 24 years each :—

Circle.	Estimated yield, in stères, in periods.					
	1st	2nd	3rd	4th	5th	Total.
Rothenbuch . . .	96,000	55,500	15,000	1,400	*Nil*	167,900
Rohrbrunn . . .	229,000	87,000	140,000	153,000	6,500	615,500
Total .	325,000	142,500	155,000	154,400	6,500	783,400

F.—Financial Results.

The average annual revenue and expenditure during the last four years, 1889 to 1892, in the Rothenbuch, Rohrbrunn, and Lohrwest Circles were as follows :—

Circle.	Area in hectares.	Revenue (marks).	Expenditure (marks).	Surplus (marks).	Net Revenue per hectare, (marks).
Rothenbuch . .	3,487	169,899	50,932	118,967	34
Rohrbrunn . . .	5,394	316,967	99,052	217,915	40
Lohrwest . . .	2,670	125,898	49,089	76,809	29·5
Total .	11,551	612,764	199,073	413,691	36

A. M. REUTHER,

Depy. Conservator of Forests, Punjab.

G. I. C. P. O.—No. 117 R. & A.—7-10-96.—500.—J. W. DeR.

APPENDIX SERIES

OF

THE INDIAN FORESTER.

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NOTES

ON THE

GOALPARA FOREST DIVISION, ASSAM

BY

T. J. CAMPBELL, Esq.,

DEPUTY CONSERVATOR OF FORESTS.

INTRODUCTION.

GENERAL REMARKS.

CONSTITUTION OF DISTRICT.

1. The Goálpára district comprises the three ancient Bengal thánas, Dhubri, Goálpára, and Karaibari with the Eastern Duárs, ceded after the Bhutan War of 1866. The former thánas, with the Gáro Hills district as now constituted, were a component part of the Bengal district of Rangpur, and came under the provisions of the decennial settlement, which was made permanent in 1793. Regulation X of 1822 removed this area from the effect of the Regulations generally; but though reasonable doubts existed regarding proprietary rights of zemindárs in the three thánas, Government conceded the point in most cases, and granted liberal terms in others. The Gáro Hills was created a separate district in 1869, but it was not till 1875 that the demarcation between the two districts was defined and declared. The zemindári and raiyatwari systems run, therefore, concurrently in Goálpára.

POSITION AND BOUNDARIES.

2. The district lies between latitude North $\frac{25^\circ\ 80'}{27^\circ\ 0'}$ and longitude East $\frac{89^\circ\ 45'}{91^\circ}$, and is bounded on the north, by the Bhutan Hills ; east, by the Manas on the north bank of the Brahmaputra and by the Singar river on the south; south, by the Gáro Hills ; and west, by the Sankos river,

AREA AND DISTRIBUTION.

3. The area of the district is 3,953·45 square miles, of which 2,373·9 square miles are permanently settled, leaving 1,579·55 square miles at the disposal of Government. The permanently-settled estates are the most favourably situated, occupying both banks of the Brahmaputra, and are consequently more densely populated, and have a larger percentage of cultivation and homestead than Government lands. Relegated to a parallelogram at the foot of the hills, Government estates are nearly equally divided into forest-clad land along the north, and cultivation or culturable waste south of it.

CONFIGURATION AND SOIL.

4. At the foot of the Bhutan Hills, there is the usual series of plateaux intersected by numerous ravines and watercourses, and the gentlest of slopes tends from this region southwards to the Brahmaputra, an average distance of from 45 to 50 miles. A poor, sandy loam superimposed on a bed of pebbles, with a good surface deposit of vegetable humus, generally characterizes the district, but nearer the Brahmaputra, there are raised areas, where a good ochraceous or laterite loam is found. Only in the south-east corner, north of the Brahmaputra, are hills existing, which partake of all the geological characteristics of the Gáro Hills. It may be accepted that the district is the result of moraine action, and the soil of that loose, free description, suitable for Sâl growth, or the cultivation of paddy.

RIVER SYSTEMS.

5. The river system is admirably distributed, the flow being from north to south. Soil conditions, however, the proximity of the hills, and the short passage to the mouth, and their own impetuosity, innundate the whole country during the rainy season, this same violence impeding floating of timber. The soil again is responsible for most of them running subterraneously during the cold season, and it is remarkable how very few of them emerge again, till immediately south of the belt of forest. Floating is thus partial and limited as to time.

TEMPERATURE.

6. The temperature during the hot months is high and very trying, and it is oppressively close at dry intervals during the rainy season, but generally it may be described as moderate. A water-logged country is, of necessity, a very feverish one, and the Eastern Duárs in particular have earned an unenviable reputation for insalubrity. Small-pox has been endemic of late years, and cholera ravages have been frequent. *Kála-azár*, the subject of such differences in medical opinion, was once rampant, but has practically disappeared for some years now. North-east winds dominate during the early portion of the cold weather, and are usually moderate, whilst violent south-westerly breezes set in in February or March, and sometimes do considerable damage. Electric

storms are frequent, and very local, whilst hailstorms are of rare occurrence. Cold-weather rain is irregular and uncertain, as has also been, of recent years, the beginning and close of the regular rains.

7. The rainfall for the last eight years is given in the following table :

Stations.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
Dhubri	104·53	100·57	100·68	111·95	72·34	123·60	89·69	82·87
Mornai	5·60	88·05	159·99	43·63	40·65	170·57	132·94	147·74
Kochugaon	5·69	95·12	105·08	42·21	71·09	135·74	134·00	117·73
Bijni	26·93	102·11	130·80	115·29	89·17	142·71	113·47	125·18
Goálpára	91·40	74·75	106·78	100·53	61·12	103·49	86·22	89·95

Some of these earlier figures bear a strong impression of inaccuracy.

8. The temperature for the same period at Dhubri is—

Year.	1888.		1889.		1890.		1891.		1892.		1893.		1894.		1895.	
—	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.	Dry maximum.	Dry minimum.
Highest	99·4	84·5	99·7	83·2	98·4	86·0	102·1	83·1	97·8	80·9	99·5	86·5	102·0	83·1	94·8	81·0
Lowest	66·9	48·1	63·5	50·2	59·4	50·6	50·6	48·5	62·8	50·5	60·9	49·0	69·6	49·0	64·3	50·2
Average	83·1	66·3	81·6	66·7	78·9	66·2	76·3	65·8	80·3	65·7	80·2	67·7	85·8	65·5	79·5	65·6

CHAPTER I.

FORESTS.

FOREST ORGANISATION.

9. The Bengal Conservator inspected and reported on these forests as early as 1868, and submitted proposals for management. These, though approved of, lay in practical abeyance till 1872, when certain areas were declared "Open forests" under Act VII of 1865 and the Bengal Forest Rules of 1871. Primitive measures were adopted, which were assumed to secure a certain amount of protection to the forests with an increased revenue. In 1874, after Assam had been severed as a Chief Commissionership from Bengal, forest administration received more attention. In 1875 a separate officer was posted to the charge of the division, since which year accumulated experience and fiscal considerations have permitted the expansion necessitated by due recognition of the rights of the State and people, and the demands of economic and physical conditions.

AREAS OF FORESTS (RESERVES).

10. The areas of reserved forests and names of reserves are exhibited in Appendix A attached to this Report.

The first reserves were gazetted under Act VII of 1865, and general forest management was regulated by the Bengal Forest Rules of 1871, which primarily brought forest-bearing tracts under the appellation of "Open forests." Thus up to 1872 lands now described as "Unclassed State forests and waste lands" were uncontrolled in any one particular. Specific rules for Assam were not promulgated till the 16th September 1876, when the distinction between "Reserves" and "Open forests" was emphasised, and for the latter, with the exception of 29 declared tax-paying trees, no royalty was realised for fuel, grass, bamboos, or other minor produce ; similarly, trees other than the exclusive 29 might be removed for either domestic or sale purposes, whilst timber-bearing land was assigned for cultivation, no charge being made for the timber on it. Still general principles were laid down and rules regarding timber-cutting, which are the foundation of the existing system. Subsequently the Chief Commissioner directed "District Officers" to distinguish, as far as possible, between "Superior" and "Inferior" forests, so that there should be some restriction on the alienation of the former for agricultural purposes. In Circular No. 43, dated 10th August 1877, the number of reserved trees in "Open forests" was reduced to 12, with the addition of such as yielded rubber or contributed to the propagation of the silkworm and lac-producing insect. Further, payments were to be exacted from timber-bearing tracts allotted for cultivation, which was not to exceed Rs. 10 per acre, and sâl-covered areas were not to be sold without the sanction of the Conservator of Forests. The introduction of the Indian Forest Act, VII of 1878, converted "Open forests" into "Protected" forests, to facilitate ultimate transfer to reserves, whilst other waste lands then became distinguished as "District" forests. The orders regarding valuations of timber on tea grants were modified, and the limit raised to Rs. 20 per acre. On the 1st October 1880, rules were declared regulating imports from Bhutan and river-borne traffic.

11. Up to the 29th December 1881, "Open," "Protected," or "District" forests were exclusively managed by Deputy Commissioners of districts, assisted by a Forest *daroga* and a few Forest guards, the details being relegated to mauzadárs. In a province where "improvidence" seems to be the ordination of Providence, the effects of such a system are easier imagined than described. Freighted with his own onerous duties, imbued with notions of the inexhaustibility of the forests, lacking knowledge of climatic and economical considerations, and with a well-meant sympathy for his people, all tended to produce in Deputy Commissioners a lively sense of antagonism to the obtrusive forest element. Fortunately, a sparse population and a chain of Chief Commissioners interested in forest matters, eliminated or reduced the mischief such management conduced to. From the date above quoted, this control was vested in the Forest officer in subordination to the Deputy Commissioner, a system which has, on the whole, worked admirably where no interference with reserved areas is attempted,

particularly as the District Officers of the day are less prejudiced than their predecessors.

12. Steady improvement, without haste and with due consideration for domestic requirements, has set in since that era, experience has modified or introduced new rules, and a system is now built up, which, accepting existing subsidiary conditions, will compare favourably with any province in India, whilst it maintains the Government ideal of strict adherence to principles, modified by conditions which are essentially antagonistic.

13. The Assam Forest Regulation, VII of 1891, having superseded Act VII of 1878, existing rules have been codified under it, and amplified or excised where necessary, but no main deviations have been effected. The rules cannot be looked upon as complete, however. The Regulation ignores "Protected" forests as distinctive, but it allows of the protection of all forest and waste lands.

14. As will be apparent from the table (Appendix A), the reserves were gazetted under a variety of rules, names, and additions, which created chaotic confusion, particularly as some of the natural boundaries could not be traced on the ground, streams were wholly omitted from one area and included in another, and minor omissions and errors were discovered, which, in the more enlightened future, might have caused trouble on questions of possession and force of law. The forests being compact blocks were consequently re-arranged, a new nomenclature was adopted, and advantage taken of this to make small additions in 1893, which reduced the length of artificial periphery, secured symmetry, and afforded more facile means for protection. The figures in the first portion of the statement were more or less approximate, as they were taken from the survey sheets after insertion of forest boundaries from indefinite points. Certain clerical errors also crept in, which appeared in various annual reports. The modified figures, except Bijni, are the results of actual survey conducted by the Imperial Forest Survey.

15. These figures give an area of 718·2 square miles, which is 18·1 per cent. of the district area and 45·47 per cent. of that at the disposal of Government (*vide* paragraph 3). Classification of forest areas in the reserves is exhibited in Appendix B, and is taken from figures supplied by the Superintendent of Forest Surveys, except in the case of Bijni, where they are roughly estimated. Reduced to square miles, the following are the results:

Description.	Area.	Description.	Area.	Total Area.
Pure Sâl	163·0	*Sisu* and *Khair* forest ...	25·7	
Mixed „	44·5	Grass lands	183·0	
„ forest	177·9	Other growth ...	2·9	
Evergreen forest ...	83·1	Rivers and swamp ...	23·5	
Sisu forest	4·1	Fire-lines	1·3	
Khair „	9·2			
Total	481·8		236·4	718·2

16. Working Plans figures differ considerably with these, and it is doubtful whether they have not been generalized too much. The mixed forests include much that a forester would term "grass land," the distinction between Khair, Sisu, and "Khair and Sisu" is incomplete, and "other growth," which is partially temporary cultivation and fire-lines, might have been judiciously relegated to grass lands.

DESCRIPTION OF FORESTS (RESERVES).

(*a*).—*Sâl forest.*

17. Sâl forest, including pure and mixed, is the characteristic feature of the district, and occupies compact areas throughout its length and breadth, except for about 900 to 1,000 square miles in the north-east corner of it. Every variety of crop is to be met with, and in some cases age classes may almost be defined. Its origin is doubtful, but the geological construction of the district is comparatively new, and probably the production of glacial action on moraines, during which Sâl may have descended from the hills amidst the general detritus. Generally the timber is seldom of great dimensions, and seems to deteriorate when over 6 feet in girth. It is also a fact that some of the best specimens are found in mixed Sâl, but this may be partially accounted for by the old system of working out the timber. In the purer areas, the action of fire and climbers, the density of growth, and entomological ravages, have produced anything but satisfactory features: in fact, all Sâl areas have suffered through these and other disadvantages. The preponderating crop is the middle-aged one. Very large areas are fully stocked. Provincial results generally show an increase of 18 inches girth in each thirty years.

18. The canopy is only sufficiently dense over limited areas to secure a ligneous undergrowth, the result being that coarser grasses largely compose that crop, to the detriment of reproduction and the encouragement of conflagrations. Great savannah lands are irregularly intermingled amidst Sâl areas, running the most sinuous of courses. Such large thickets of Sâl exist in other cases that thinning is necessary to prevent deteriorating growth. Coppice shoots are not common, the system of fellings only including exploitable timber.

(*b*).—*Mixed forest.*

19. This is really a mixture of deciduous and evergreen forest, amidst which occasional specimens of Sâl are found, and which is mostly suitable for the extension of Sâl. There are some splendid specimens of timber, both in size and quality, but much of it is isolated amidst grass areas, and suffers in consequence. The really deciduous forest is scattered along the margins of evergreen and Sâl areas, and being most subject to devastating fires, the softer-wooded species have been encouraged. The areas are scattered throughout the district.

(*c*).—*Evergreen forest.*

20. A really compact block of this forest lies immediately at the foot of the Bhutan Hills between the Pisu and Bora Bhur rivers. It is a great depression, in which there is little big or valuable timber. Elsewhere this forest occupies small areas in the Bijni reserve and narrow margins along banks of most streams. It lies too low for Sâl growth.

(*d*).—*Sisu and Khair forest.*

21. Grouping these together, this description of forest is found along banks of most of the rivers, where the loose soil is so favourable to its growth. The larger and more compact areas are found on the Sankos, Hel, and Saralbhanga rivers, and again on the Sukan Takulai, Kanamakra, Koklung, and Mora Kuklong rivers of the Bijni reserve. There are some splendid specimens of Sisu, and a few of Khair, but in both cases the smaller trees predominate. Sometimes each grows in compact separate blocks side by side, in other cases they are more or less mixed ; but in the latter the Sisu seems to be driving out its associate. The Khair, with its weak root ramification, does not persist in inundations as the Sisu does. The latter, too, extends rapidly by suckers.

(*e*).—*Grass lands.*

22. Immense grass savannahs traverse the district from one end to the other, separating the forests at the foot of the hills from those along the Brahmaputra. Confining them to reserved areas, they occupy a greater portion than any other description of cover, intermingling with forest areas in compact blocks more or less connected, in numberless glades, and predominantly as undergrowth. The coarser specimens of *Andropogon*, *Saccharum*, and *Catharticus* form a perfect sea of grass, reaching as much as 20 feet in height, though the average is from 10 to 15 feet. *Panicum* and lighter grasses are only found where soil is good and the canopy dense. Except where subject to persistent inundation, these areas are admirably suited for Sâl growth, and encroachment on them is conspicuous, where subject to the influence of Sâl. Specimens, generally of the softer-wooded trees, are well dispersed throughout. The numerous depressions in their midst are gradually being raised by deposits of humus.

23. A list of trees growing in the district is attached to these Notes.

DESCRIPTION OF SOIL (RESERVES).

Ripu, Chirang, and Bengtol.

24. Omitting the isolated Guma and Bhumeswar Hill reserves, the area covered by the working plan is a compact block, trending southwards from the Bhutan Hills, with an almost imperceptible gradient. The soil is alluvial, formed by scourings from the hills and varying from a

poor to a loamy sand, improving to a sandy loam by accumulations of decomposed vegetation. The formation is somewhat irregular, as exhibited in the numerous depressions lying between forest-clad areas, now covered as dense savannahs with *Andropogon, Saccharum, Cathartícus,* and other coarse grasses. These partially or wholly inundated localities are, in exceedingly few instances, of a permanently water-logged, sphagnous or peaty character, and are gradually being raised by humus deposits, affording sufficient basis for the establishing and fostering of Sâl seedlings, dissemination being partially anemophilous. The soil is superficial along the eastern, western, and a portion of the southern boundaries, but where the canopy is dense, covering a central zone of over half the area, the loam is light, but deep, and the whole superimposed on a bed of pebbles, bristling on the surface where the forest is poor. The sub-soil is loose almost to disintegration, which renders it specially favourable to the extension of Sâl with Khair and Sisu as subsidiary gregarious elements. This formation accounts for the waterless condition of the northern two-thirds of the area, the rivers subsiding in the cold weather and re-appearing much further south.

Guma Reserve.

25. Guma, an area of 25 square miles, lying to the south-west of the above block, is the northern termination of a curiously-raised plateau, which runs south to the Brahmaputra, following its bank for about 10 miles. The soil is deep, a good loam without rock or pebbles, and approaches a laterite or ochraceous clay in character in many places. It contains a comparatively few insignificant grass-clad depressions, except on the east, where the Tipkai river rises. It is a pure Sâl-covered area, and reproduction is assured, and of a most successful description.

Bhumeswar Hill Reserve.

26. Bhumeswar Hill, an area of about 7 square miles, lies to the south-east of the first block, and is one of those isolated conspicuous hills which are a special feature of the south-east corner of the district, north of the Brahmaputra. It is very prominent, trending from north to south with all the structural conditions of the northern slopes of the Gáro Hills. There is a large surface of bare, exposed rock of a gneissose character, also distributed freely above the level, the soil being decomposed gneiss with a little humus, chiefly accumulated in rifts, crevices, etc., in which and along the crest a few Sâl poles are found, the rest of the vegetation being a wretched scrub and secondary growth. The richer deposits at the foot of the hill, however, contains Sâl poles of very good character, which is extending.

Bijni Reserve.

27. This reserve is composed entirely of scourings from the hills, the soil generally being of the poorest possible loam, the surface covered with sand and pebbles, and the sub-soil being a continuous mass of pebbles. There is a marked uniform declination from the hills southwards,

and the waterflow is consequently very rapid. The coarser grasses cover two-thirds of the area, and the forest growth is limited to Khair, Sisu, and particularly hardy timbers. A little evergreen forest is found in pockets at the immediate foot of the hills.

Inundations (Reserves).

28. Except where debouching from the hills, all river banks are very low, and the suddenness and violence of torrents during the rains floods all areas in the vicinity. This has materially damaged some of the forests, large areas of Sisu having been killed on the Sankos, and Sisu and Khair on the Hel river, whilst Sâl has suffered equally on the Pekua, Champamoti, and Bara Bhur rivers. Inundations on grass lands, too, have done harm in removing vegetable deposits, and thus preventing germination of seed.

AREAS OF FORESTS CLASSIFIED.

Unclassed State Forests.

29. The figures in paragraphs 3 and 15 show that, outside the reserves, only 861·35 square miles remain at Government disposal for cultivation, forest, and waste. Of this, 105·9 square miles are temporarily settled as cultivation, and 1·57 as special lands. Thus, 753·88 square miles are left for forest and waste. It is probably approximately accurate to estimate 700 square miles of this area as grass land with a little sporadic growth of soft-wooded trees, and to describe the remaining 53·88 square miles as forest.

30. Sâl forest is found along the banks or in the vicinity of the Gorupila, Saralbhanga, Kasikuri, Saumukha, Champamoti, and Bara Bhur rivers, and in small detached blocks elsewhere, and it is somewhat singular that all these growths lie along margins of existing rivers or abandoned basins. They possibly cover 25 square miles.

31. Sisu forest exists between the Saralbhanga and Longa rivers, but is much scattered except immediately along their banks. It possibly does not cover 5 square miles.

32. Khair forest occupies narrow margins of some of the dry streams south of the Bijni reserve, and does not contain a square mile.

33. Evergreen forest may be eliminated in this case.

34. Mixed forest occupies about 23 square miles, and is scattered throughout the district.

35. The grass-clad area is suitable for cultivation.

36. Detailed descriptions of these forests are unnecessary, as most of this timber is inferior in size and quality, subject to continuous burnings, and showing no signs of expansion.

SUFFICIENCY OF AREAS.

37. The figures recorded show clearly that the State has, on the one hand, secured all the valuable forest area for scientific management, and has at the same time left more than ample at the disposal of the raiyat for agricultural purposes. Though 25 square miles of Sâl forest are available, these, existing in attenuated, long, irregular lines, with interruptions of cultivation, would render efficient protection a financial impossibility. Further additions to reserves are not contemplated, except for a small area to facilitate district fiscal arrangements with the Sidli Rája. On the other hand, it would be folly to alienate a single acre till justified by the demands of an increased population, which has now at its disposal seven times the area it can bring under cultivation. Even grass lands must improve under regular management, and, when necessity arises, these can be made over to the Civil Department, enriched by the attention they have received, but this very reason should induce a firm stand by the proper custodians of State property interests against unreasonable surrender. Now that tea speculators threaten the district, these matters are worth serious consideration. *Jhum* cultivation in its strict sense is not practised in this district, but a modification of it termed "*asu*," whereby the grass is cut and burnt and ashes tilled into the soil, is prevalent, and on the higher lands a regular rotation is adopted.

FOREST SETTLEMENTS.

38. Settlements are matters of comparative ease, where the property is in the sole proprietorship of Government, and thus no difficulty has been experienced in making such. Resources of unclassed State forests are considered sufficient to justify neither the recognition nor grant of rights in reserved forests. Neither interference nor control is exercised over the property of private owners.

DEMARCATION.

39. All reserves are well defined by natural or artificial boundaries. The latter are conspicuously marked with raised earthen mounds, 5 feet in height and 10 feet in diameter, with Sâl posts of 8 inches diameter heartwood embedded in the same, each being numbered serially. This is strengthened by a well cut foot-path, connecting the outer margins of boundary mounds. The external artificial delineation has a perimeter of 108 miles 69 chains, with 386 boundary mounds, and, accepting the varied lengths and averages for the last five years, has cost Rs. 2-4-8 per mile. Practically, this has all been spent on new work, as every boundary post has been renewed, every mound raised from insignificant heaps, and every inch of foot-path cut in the last four years. This extraordinary cheapness, however, is influenced by a fair abundance of free labour and a division with fire protection expenditure, when the line serves both purposes.

40. To carry out the provisions of the Working Plan, the demarcation of blocks became a necessity. Advantage of rolling paths was taken where possible, but these need extensive fellings and clearances before

definition is distinctly secured. In other cases, lines have had to be cleared right through the forest. Paucity of labour and insufficiency of funds have caused progress in this direction to be somewhat slow, but, though gradual, it is certain and is being persisted in. The length of lines, all more or less improved, is 67 miles 56 chains, and this work has cost, on the average, Rs. 5-1-5 per annum for the last three years, since the work has been instituted.

41. In the earlier period of the division's history, Mr. W. R. Fisher divided the Guma reserve and the greater portion of the old Sidli reserve into squares by running lines parallel to, and at right angles with, each other, a mile apart, on the German model. Many miles of these "rides" were thus cut, but not opened for so many years that they were choked and unrecognizable in places. As these may become useful traffic arteries, and are useful to subserve the purposes of fire-lines, and in the case of Guma are recognized divisions of working coupes, a few have been opened out for each of the last three years. Squared posts with inscribed numbers indicate every line and crossing in Guma and all lines in Sidli, where they emerge on external boundaries or the road. There are 95 such posts, and an average of 31 miles 8 chains has been cleared each year, at a cost of Rs. 4-13-10 per mile.

42. The ordinary boundary damages are usually those caused by wild elephants, bears, and pigs, and the growth of ant-heaps. The total cost to the close of 1894-95 has been Rs. 8,122-2-3.

SURVEYS.

43. For the early constitution of reserves, the topographical survey sheets were adopted, and linear surveys connecting extremes of severed areas were run and inserted on the maps. That this was fairly well done is clear from a comparison of the figures with those now submitted by the Superintendent of Forest Surveys.

44. From 1875-76 to 1878-79 Messrs. Fisher and D'Arcy completed surveys of Sidli and Guma Sâl forests, subdividing these into blocks and compartments, and depicting classified areas.

45. In November 1889, the Imperial Forest Survey commenced operations in this district, and only closed field-work in June 1893, covering an area of 522 square miles of reserves. The usual topographical details, with distinctions of classification, came under the survey. In addition, the whole length of the Bhutan boundary was surveyed. The total cost of surveys, as exhibited in the Annual Report for 1894-95, amounted to Rs. 80,203, but it is impossible to strike an average cost of the work from this, as the survey has some mysterious manner of distribution of cost which is beyond the ken of a layman. To the Department, however, since organization commenced, the cost per square mile has been Rs. 127-8-0, or eliminating Bijni, which must have cost an infinitesimally small sum, the cost has been Rs. 175-8-11 per square mile, the total expenditure amounting to Rs. 91,659-2-3. Maps not being prepared nor furnished to date, further expenditure must be incurred.

CHAPTER II.

MANAGEMENT OF STATE FORESTS.

WORKING PLANS AND THEIR CONTROL.

46. Working plans and survey operations commenced synchronously in November 1889, the work terminating early in 1893, but the plan was not received in print till October 1894. It is exclusively confined to Sâl forest areas, has a rotation of 10 years, and fixes the girth of the exploitable trees at 5 feet. It divides the area into five working circles, 28 blocks, and 87 compartments. The area to be worked over and the number of trees to be felled annually, with results, appear in the following table :

Year.	Area, in acres.	Number of trees.	Area worked over.	Trees actually felled.	Deficit.
1893-94	7,505	5,715	1,840	322	5,393
1894-95	7,989	6,593	7,351	1,740	4,853
1895-96	7,576	7,203	...	...	...
1896-97	7,416	5,411	...	...	...
1897-98	7,863	5,164	...	...	...
1898-99	7,323	6,178	...	...	...
1899-1900	7,792	5,683	...	...	...
1900-01	7,960	5,994	...	...	...
1901-02	7,204	5,574	...	...	...
1902-03	8,360	6,300	...	...	...
Total	76,988	59,815	...	...	...

47. It is thus obvious that the trade demand is not equal to the present capability of the forest, and it is as well that this should be so, as the number of exploitable trees is possibly exaggerated. With the introduction of the plan, to make incidence of cost per cubic foot more equable, the rate per tree was abolished, and one for logs in girth classes substituted for it. This, with enforcement of sylvicultural rules regulating selection and locality of coupe, has met with much opposition from timber-workers, and has contributed towards the diminished demand of recent years.

48. The cost per square mile of this work is shown as Rs. 73-14-5 in the plan itself, but this omits the pay of a divisional officer exclusively employed on it, and possibly other members of the establishment.

49. Valuation survey lines were run through various areas by Mr. W. R. Fisher in 1875-76, and on to 1879-80, and concentric rings of Sâl trees were counted, the figures for the same appearing in the annual reports of the years referred to, but no recognised plan was framed on the results. In 1883-84, further valuation surveys in Chirang were made by Mr. Jellicoe.

COMMUNICATIONS AND BUILDINGS.

50. There are no departmental roads maintained by the division, nor, whilst the present system of working is in force, are any necessary. Should they become so, it is feasible to construct them at a comparatively low cost within the forests, as dragging and rolling paths lend themselves to easy conversion, whilst gradients are easy where existing, and there is little marshy ground to avoid. If it was deemed advisable to connect the forests with streams, where navigable throughout the year, or where floating facilities existed on reasonable terms, such roads would be possible for cold-weather purposes only at no prohibitive cost. As the trade demand stands, however, it is not justifiable to spend a penny in this direction, unless some new remunerative source presents itself. About 31 miles of district road pass through or along reserves, which from any point could easily be connected with almost any portion of the district road system. Practically, nothing has ever been spent on road work in this division, the Rs. 343-10-5 actually spent being absorbed in temporary paths, etc.

51. The Department maintains inspection bungalows and out-houses at Barabadha and Gorubhasa, with inspection huts and out-houses at Sankos, Patgaon, Haltugaon, Dangsibari, Bhur, Kakragaon, Borgaon, Makragaon, Savaijhar, and Simlabari. Range officers are furnished with houses, offices, and out-houses at Barabadha, Kochugaon, and Gorubhasa, whilst Working Circle foresters have buildings at Sankos, Patgaon, and Bengtol. Most of these have been newly built or wholly renewed within the last four years, but in the current year floods carried away the Sankos buildings, and seriously damaged those at Gorubhasa. In addition to those enumerated, the Department owns the forest bungalow at Dhubri, with office, godown, and out-offices attached. The value of these buildings is shown as Rs. 14,015, but really exceeds this sum considerably. Expenditure on these buildings has during the last four years been—

Year.	Original work.	Repairs.	Total cost.
	Rs.	Rs.	Rs.
1891-92	...	1,257	1,527
1892-93	782	900	1,682
1893-94	1,324	632	1,956
1894-95	868	461	1,329

52. This leaves out of consideration assistance afforded by "free" labour, cost of timber, etc., but in an unhealthy climate, with solitary and uncongenial surroundings, subordinates need offices they can take a pride in, and to be secure from unnecessary risk in their own quarters. The service is most unpopular, and some little attractions are necessary. Much improvement is contemplated in this direction in the future. Buildings to the close of 1894-95 have cost Rs. 30,390-12-4 in construction, improvements, and maintenance.

GENERAL PROTECTION AND BREACHES OF FOREST LAW.

53. Protection and management are secured by the division of the reserved area into three ranges as units, which are again subdivided into working circles and beats. This arrangement is specially designed to control river traffic, floating being an absolute necessity in the extraction of timber. Stations are fixed for check of Bhutan imports, and forest depôts on the Brahmaputra and its tributaries for exports.

54. The system for working out timber is susceptible of little or no improvement in the control exercised. Recognised marts for barter exist, chiefly on the Brahmaputra, under the immediate control of Forest subordinates, subjected to a variety of checks. Timber-workers, too, are of a peculiarly honest class as a rule, and the only offences reported in this connection are trivial breaches of rules, to secure such floating or sale advantages as may present themselves suddenly. For produce for domestic purposes an occasional offence is committed, but this is usually obviated by the principle of making large grants in return for labour. Fires are the specific source for caution and regulation, as the casual habits of the people induce them to fire indiscriminately and without precautions jungle in the vicinity of their villages, and for future cultivation or grazing purposes. Of late years, rules being promulgated and strictly enforced, there has been much more caution in this direction. Intentional incendiarism has been unknown for years, though it was of frequent occurrence in the early history of the reserves. A sparse population, mere timid half savages, and almost as much denizens of the forests as the natural fauna, with liberal free grants from reserves, and the privilege of practically unlimited supplies for domestic purposes from unclassed State forests, necessarily commits no offences other than those generated by traditional and inherent thoughtlessness. The Bengali trader, having no stomach for these unhealthy, ill-reputed areas, has no scope to exercise his unique ingenuity, except at sale depôts, where Greek meets Greek, and the timber-worker sometimes scores.

55. Advantage is taken of the compounding clause wherever possible, as this tends, on one side, to increase departmental influence, whilst, on the other, it is a real mercy to the offender, who thus evades the law's delays, and myrmidons, far more serious sources of terror to him than the actual punishment. Such power, too, exercised judiciously, has a wholesome effect in removing antagonism.

56. The following table will show how comparatively rare cases are :

Year.	Injury by fire.		Unauthorised fellings.		Unauthorised grazing.		Other offences.	
	Cases.	Persons.	Cases.	Persons.	Cases.	Persons.	Cases.	Persons.
			Taken into Court.					
1875-76	...	...	3	13	...	...	...	...
1876-77	...	...	...	...	...	...	...	...
1877-78	2	4	...	...	...	...	...	...
1878-79	4	23	2	3	...	...	...	...
1879-80	3	19	...	...	...	...	2	7
1880-81	...	...	...	...	...	...	...	...
1881-82	...	...	...	...	...	...	...	...
1882-83	...	...	2	11	...	...	1	1
1883-84	1	2	...	...	...	...	1	3
1884-85	3	10	1	2	...	...	1	1
1885-86	1	3	2	4	...	...	2	4
1886-87	...	...	...	...	...	...	4	8
1887-88	...	...	...	...	...	...	5	14
1888-89	1	3	...	...	...	...	...	...
1889-90	2	2	...	...	...	...	1	1
1890-91	...	...	2	9	...	...	...	...
1891-92	4	9	...	..	1	1	1	1
1892-93	1	4	...	...	...	...	2	7
1893-94	2	15	...	...	...	...	...	...
1894-95	...	...	...	...	...	...	...	...
Total	24	94	13	42	1	1	20	47

Year.	Injury by fire.		Unauthorised fellings.		Unauthorised grazing.		Other offences.	
	Cases.	Persons.	Cases.	Persons.	Cases.	Persons.	Cases.	Persons.
			Compounded.					
1883-84	1	1	...	...	...	...	1	1
1884-85	...	...	...	...	...	...	...	...
1885-86	1	18	1	1	...	...	...	...
1886-87	2	5	1	11	...	...	...	...
1887-88	4	11	...	...	...	...	1	4
1888-89	4	24	2	4	...	...	2	4
1889-90	5	10	5	7	...	...	...	...
1890-91	8	10	6	18	2	2	5	5
1891-92	3	4	3	3	...	...	...	...
1892-93	1	2	3	3	1	1	2	2
1893-94	...	...	1	1	...	...	4	24
1894-95	...	...	1	4	...	...	7	8
Total	29	85	23	52	3	3	22	48

The sum received for compounding offences amounted to Rs. 2,741, an average of Rs. 14-9-4 per head.

PROTECTION FROM FIRE.

57. The cover demands unremitting and sustained attention in the direction of fire protection. The material is of the most inflammable description, the forests waterless in the cold weather, the luxuriant growth of the grasses, want of ligneous vegetation, absence of continuous masses of alpiniæ, of sphagnous bog or other friendly arresting barriers, the presence of soft-wooded deciduous trees generated by continuous burnings and evolved out of poor shallow soil, the variety in moisture which makes artificial lines ineffective and disperses fire which has entered the forests in every direction, the fact that all forest areas are immersed in a sea of grass land dotted over with villages; all tends to make protection work of the most harassing and exacting character. The rainfall, uncertain in quantity and duration, is another factor of importance, as continued late, grass retains moisture till the south-west winds set in and render burning of defensive lines dangerous; if it closes early, the labour-supply does not suffice to take advantage of it. Sudden, violent,

and local electric storms are characteristics of regions at the foot of the hills, and have on more than one occasion caused burnings. Lightning burnt two small areas in 1892-93 in the very midst of extensive forest. Ill-conditioned trees frequently retain the smouldering elements under the bark for considerable periods, such a case of two months' standing having occurred in Bhur. The area generally is not evergreen or moist like Upper Assam, but corresponds more with conditions in Jalpaiguri. described by a Bengal Conservator as so many powder magazines, Nor is it possible to adopt the Bengal plan here of burning lines without protective belts, for, though undergrowth there may be sufficiently green to refuse ingress to fires, there would be no difficulty in penetrating areas here, and the danger is enhanced annually by the accumulation of additional dead matter. The forests are assailed on every side, Nepali graziers in the north, Bhutia routes through the reserves, strolling drovers, rubber-seeking and general jungle-product collectors, careless timber-cutters, all enter into the contending elements. The variability of the wind is perhaps the worst source of danger, as, constituted as the flora is, once defensive lines are being burnt, they cannot be stopped when necessity demands that this should be done. The wind comes with extreme violence and shifty gusts from the south-west, where immense grass-clad areas are contiguous to, and connected with, the reserves. There is much low swampy country in such an area, and the gases suspended over these spots ignite with the heated air, and send on regular balls of fire in leaps and bounds, far in advance of the initial fire. The protective belts, too, are frequently, of necessity, adverse to each other, and the want of division of fire blocks is a matter of grave danger. There is no favourable element of success beyond that fortuitous one, luck, for the labour-supply is of the scantiest, and the people the most apathetic on earth. It is this crying want of labour which compels such enormous risks to be undertaken and undergone. When fires are observed in reserves villagers flee to the jungles, and are secure against rendering enforced assistance. The vicinity of reserves is not palatable to them, as children playing near the villages fire the jungle, tigers are preserved to kill their cattle, elephants, bears, deer, and pigs to ruin their crops, nor can they fire "*asu*" lands without precautions. Cholera is a frequent visitor, small-pox almost endemic, tea gardens offer great inducements, and are obtaining about 6,000 souls a year now for temporary emigration to Upper Assam, the Department Public Works pay from 25 to 50 per cent. higher wages, and thus the labour supply available is less, now that over 700 square miles are protected, than when that area did not exceed 100 square miles. It has been necessary to import a few Santhalis of recent years, but this can only be done on a very small scale. The establishment is another unsatisfactory feature. The pay is constant, but supplies have risen in value of late years. The duration of appointment is uncertain, depending, as it does, on the length of the dry season. Home-sickness is one failing which requires recognition. As a rule, men only join with some definite object in view, such as the accumulation of a few rupees to pay off debts, or for the conclusion of matrimonial arrangements, or some equally interesting social necessity.

58. The work is very exacting and exhausting, involving much night work, and there is much sickness in consequence. It is only possible to burn the lines late of an afternoon and at night. There has been vast improvement in the establishment of late years, and many men are now well trained. In addition to cutting fire-belts, the grass is pressed parallel to them for a breadth of fifty or more feet by elephants dragging logs over them. Annually, a few trees affecting work adversely have been felled along these lines, thus contributing to safety, but an enormous deal remains to be done in this direction, which can only be met very gradually for financial and labour reasons. The "free labour" obtained has been satisfactorily distributed, well organized, and full results obtained from it. Certain old fire-traces, which were simply a source of danger, have been abandoned, and more effective ones substituted for them. Responsibility has been brought home to subordinates, and these are the reasons for the more satisfactory results of recent years. The elimination of a portion of Bijni, the improvement of communications, and further fellings should make these results constant. Fire-lines on roads and block lines need wholesale clearing, and this has been carried out along over 7 miles of the Sidli road, a small portion of the Haldibari road, half the North Sidli line, and part of the North Charaidaka line, the fellings paying handsomely.

59. The work last year involved the clearing, pressing, and burning of :—

108	miles	69	chains	of boundary lines.
124	„	40	„	river or natural external lines.
98	„	30	„	block lines.
67	„	6	„	rides.

This does not include much burning that is necessary along rivers, etc., where no clearing is required. On the average, it takes three burnings to clear a line to render it safe. In addition to the paths along demarcated lines, 20½ miles have been constructed along fire-lines.

60. The table in Appendix C gives figures since protection was introduced. Up to 1882-83, figures require acceptance with a certain amount of caution, as the cost was largely influenced by reduced establishments owing to early burnings. During the following five years of a low percentage of burnings, the areas are open to suspicion, as the length of external and internal lines cut and burnt was only 76 miles. The whole reserved area only came under protection from 1889-90, when Mr. Mein took it in hand, with very sad results, but still what might have been expected from an experimental year in a district new to the officer himself. Previous to that, the whole of these Sâl areas were burnt over by the Department annually, which accounts for the present appearance of the stock. It is satisfactory to be able to observe that the originally-protected areas have almost wholly escaped burnings during the last ten years, excluding 1889-90. It is unfortunate that records do not exist showing actual areas burnt and the number of times definite portions of the same have had to

submit to the infliction. For the last four years such a record is available, and appears in the following table :

Reserves.	Area burnt, acres.										
	1891-92.	1892-93.		1893-94.		1894-95.		Once in period.	Twice in period.	Thrice in period.	Total.
	New.	New.	Previously burnt.	New.	Previously burnt.	New.	Previously burnt.				
Guma reserve ...	...	...	...	7	...	...	...	7	...	...	7
Ripu ,, ...	26,916	1,252	1,088	...	13,444	160	20	13,776	14,532	20	28,328
Chirang ,, ...	...	2	...	...	...	4	...	6	...	...	6
Bengtol ,, ...	1,440	1,209	387	...	...	...	...	2,262	387	...	2,649
Bhumeswar Hill reserve.	...	...	...	...	...	...	...	...	...	...	...
Bijni	51,200	...	...	1,976	20,480	...	23	32,673	20,503	...	53,176
Total	79,556	2,463	1,475	1,983	33,924	164	43	48,724	35,422	20	84,166

61. Thus, where Appendix C shows 119,608 acres burnt over in the four years, that actually burnt only amounts to 84,166 acres. From this it would only be fair to eliminate Bijni, with its compact mass of 70,000 acres of grass, and the balance of its area, a very series of powder magazines. On all four sides it is surrounded by grass, even the Manas affording no protection, but enhancing danger, as it is a line of encampments. The irresponsible Bhutia on the north cannot be interfered with for political reasons, even if the timid Assamese dare oppose the wild, untutored hillman. A series of passes run through the reserve, and are frequented throughout the whole cold weather. The tract is absolutely waterless, and its sporadic deciduous trees are as dangerous as the grass. Not a pie of revenue has ever been yielded by this reserve, nor is there any immediate prospect of revenue; thus protection has been limited to the barest possible necessities, and the area can be considered as "partially protected" only. Abstracting this area, that covered by fire in four years over 522 square miles, is only 30,990 acres, or 2·3 per cent.

62. Turning again to Appendix C, the cost per square mile attempted, actually protected, and the sum it has cost Government to attempt protection to date, show satisfactory results, despite many disastrous years and the necessary cost of experience. In recent years in particular, the decreased cost is marked, and, though this low standard cannot be maintained, it is obvious that it is approximately permanent. The increased areas naturally reduce averages of expenditure, as proportionate cost of establishment and work does not increase on parallel lines. This division furnishes 62 per cent. of the fire-protected area of the province.

63. No effort is made to protect any of the unclassed State forest areas, nor are they worth it at present

GRAZING.

64. Grazing in reserved forests is permitted, under control, to villagers residing in the vicinity of reserves, and to Nepali herdsmen in isolated situations, where they can be of service as unpaid fire patrols. No payments are exacted, but definite quantities of work, free of payment, are given in return for the privilege. Where buffaloes are concerned, the grazing area is usually limited to uncovered grass lands, whilst village cattle pasture over the well-stocked forest areas adjacent to villages. There is no real closed season, but, as a matter of fact, such areas are only used in the cold weather. The number of cattle and area grazed over naturally vary annually, the figures for last year being 2,007 head of cattle to 135 square miles, or 43 acres per head. The grazing is of the lightest description.

65. In unclassed State forests grazing continues free for cattle used for domestic and agricultural purposes, whilst those of nomadic habits, kept for stock, sale, or sale of produce, pay fees at the rate of 8 annas per head. The people keep no more than suffices for their agricultural requirements, as they do not use the milk, nor kill for the meat. Usually they are poor specimens, as there is apparently too much moisture in the grass for nutritive purposes, and no steps are adopted in the interests of breeding. Nepali graziers introduce large numbers of buffaloes, a most lucrative speculation. Still the proportion of these and domestic cattle combined is infinitesimally small in comparison with the pasturage available, which is about 700 square miles. Figures are not available to show the number of existing domestic cattle, and buffaloes vary in numbers annually, as they thrive on constant change. Sums received from this source are trifling, however, and are exhibited in the financial statement attached as Rs. 1,009-4, of which only Rs. 63 were realised from reserved forests. Fodder is not cut, as cattle are never stall-fed in Assam.

NATURAL REPRODUCTION.

66. The struggle for existence has been a very severe one. Indiscriminate fellings, a dense undergrowth, the action of fire and erosion, entomological pests, poverty of soil and cover in places, the existence of climbers, and bad seed seasons, with various physical disadvantages, have been a powerful combination which only the hardy Sâl and its associates could oppose. Early fellings have left open glades and exposed the soil; the undergrowth of coarse grasses in particular sterilizes the fallen seed before it can reach the ground; fire has produced heartshake, the development of abnormal shoots lying latent, and a general poverty in appearance and quality when the timber is young; erosion has killed outright the Sâl on large areas in the vicinity of rivers; entomological pests never absolutely forsake these forests, and the consequent defoliation requires the whole assimilating substance to recover the trees to the disadvantage of seed-production; soil and want of cover retard growth and kill out numerous seedlings; climbers have spoilt the symmetry of many trees; bad seasons have been frequent, and density of sapling growth has had ill effects. These remarks

apply almost exclusively to Sâl, which is the prominent feature of the district, yet the tree thrives and is expanding and encroaching visibly on all grass and mixed forest areas. Even low lands, gradually being raised by deposits of vegetable humus, are occupied once they afford foothold for a seedling. The tree is generally a splendid seed-bearer, but during the last four years seed has been a failure. In 1892-93 the cause was climatic, intense cold and rain being constant at the season of most active vital growth. Such seedlings as were produced suffered from floods during the following August. In February 1893, the inflorescence promised a most abundant crop, but climate again arrested development, the seed proved infructive, and not 5 per cent. even germinated. The 1893-94 crop suffered similarly, hail assisting to ruin the inflorescence. The tendency to spread is eastwards, and seed falls when the south-west winds are prevalent. Coppice growth is conspicuous by its absence, as immature trees are not felled.

67. The arch enemy, however, has been the *Dasychira thwaitessii*. Mr. W. R. Fisher noted their ravages as far back as 1878-79, and wrote a most interesting note on the same. Though reports are almost silent on the subject subsequently, except one of 1887-88, when all Guma with Parbatjuar, estimated at 150 square miles, succumbed to defoliation followed by a failure of seed, there is no doubt, but that the pest was a permanent establishment, and only kept within bounds by the parasites living on it, who destroy their hosts wholesale. In May and June 1892, they covered 25 square miles in varied portions of the reserves, no single area exceeding two square miles, and favoured poor soils and dry localities. The subsequent rains, interfering with their metamorphosis, did not enable them to do much damage. In the succeeding year they were dominant and rampant as were insects generally. No vegetation escaped them, and though broad-leaved trees were the special subject of attack, even the linear blades of grasses and suffrescent shrubs like *Grewia sapida* received deliberate attention. Neither position, species, soil, nor description availed for protection, though certain conditions were more favoured than others. In addition to the *Dasychira thwaitessii* affecting Sâl, there was the *Orthopterous mantis* on *Dalbergia Sissoo*, the *Hemipterous cicada* on the grasses, and a *Coleopterous chrysophera* which favoured Sâl, *Careya arborea* and various small Acacias. It was estimated that, including reserves, trees were more or less defoliated over 800 square miles. In April and May 1893, the *Antheræa Assama* appeared in the Charaidaka and Hel blocks, and caused some damage to the foliage ; a specimen or two of the larva having been subsequently discovered, gives reason for dreading another invasion later on. At the same time further specimens of the *Dasychira* were found, and much damage has been done through the rains, especially in Guma, though it has spread throughout the reserves on a milder scale. Three different species of the *Dasychira* are probably at play, from specimens of the imago found in October 1894.

68. But the reproduction of other trees is as secure as Sâl. Most prominent are *Dalbergia Sissoo, Acacia catechu, Albizzia procera, Terminalia belerica* and *chebula, Bischoffia javanica, Bombax malabaricum, Sterculia villosa, Artocarpus chaplasha, Schima mollis, Stereospermum chelonoides*, etc.

ARTIFICIAL REPRODUCTION.

69. There are no plantations in the division, nor have cultural operations been attempted in an organized manner. The system of arbori-jhum culture was attempted in 1889-90, and was carried on for a year or two, the effort being to disseminate Sâl and fill up culturable blanks. This, as it was bound to do, under contingent conditions, was a failure.

EARLY THINNINGS.

70. None have ever been attempted, but the young Sâl growth indicates the possible necessity for it at no distant time.

CLIMBER CUTTING.

71. The whole reserved area is, more or less, affected and influenced by climbers. As a general rule they are not of great size, but are ubiquitous, and as there is a much larger proportion of immature than of mature timber considerable damage is caused, as is evident from numberless gnarled trunks. Further, with this continuous protection from burning, they are on the increase, the spread of *Millettia* in the last four years being something marvellous. The chief climbers are *Spatholobus Roxburghii*, *Millettia auriculata*, and one other species; *Dalbergia scandens; Briedelia scandens; Entada scandens*, with varieties of *Indigofera* and *Acacia*, as well as harmless *Thunbergia* and *Sepiaria*.

72. The necessity for extirpating these has been recognized for years, but labour and the financial bogie have again deterred anything but spasmodic efforts over scattered areas. In no less than 11 out of the division's history of 20 years have climbers been cut, but the whole area covered has only amounted to 65 square miles, and has cost Rs. 2,465. As no regular system was pursued, nor clearances depicted on maps, there is no information as to areas actually worked over.

CHAPTER III.

GROSS YIELD AND OUTTURN OF FOREST PRODUCE.

73. The table in Appendix D contains figures for 20 years. They are only so far instructive as to show how uncertain the market demand is, and how fluctuating. Figures furnished in the annual reports are puzzling, as in the earlier years they include transfers from other districts, whilst later the factor for estimating cubic contents has been modified, *e.g.*, in the case of Sâl, it was 30 cubic feet up to 1889-90, when it was raised to 40, and then again to 50 in 1892-93. The classifi-

cation, too, of poles and miscellaneous timber has been much mixed in different divisions. Further, the estimated contents of dead-wood and free permits are undoubtedly much exaggerated, as are extractions under home consumption permits.

DESCRIPTION OF DEMAND.

74. The demand for Goálpára timber is foreign, and limited to the Bengal districts of Rangpur, Pubna, Mymensingh, Faridpur, and Dacca. It is almost exclusively extracted in the form of *dhums* (logs between 6 and 7 feet in length and over 2½ feet in girth) and poles, the former being a necessity of the boat-building trade, and the latter in varying lengths satisfying the requirements of native house-building. Timber of greater dimensions has only been exported on a comparatively infinitesimal scale for scaffolding in corrugated-iron roofs, important bridges, etc. This demand is being curtailed by the use of rolled iron joists and old rails in public and private buildings, factories, bridges, etc. The extraction of *dhums* used for boat-building is also on the decline, as steamers plying on all important rivers are driving the trading boat gradually from its former lucrative haunts. *Dhums* and large timber are only yielded by Government forests, and, in addition to reasons already given, the demand is always influenced by agricultural depression. Assam Sâl cannot compete in dimensions with specimens from Nepal and some of the Bengal districts, and is consequently unknown in the Calcutta market or the centres of railway and engineering enterprise. Further, expense in transit is so great that Burma teak can be sold at a lower rate in Calcutta. In Sâl poles the export has doubled in recent years, partially due, however, to reckless speculation, as recent inquiries showed immense stocks on hand unsaleable at present, but these are almost exclusively furnished by zemindári forests aligning, or in the vicinity of, the Brahmaputra and other important streams.

HISTORY OF THE TIMBER TRADE.

75. The Gáro Hills, Kámrúp, and Goálpára districts furnished timber to Bengal long before the introduction of British rule. As far back as 1850, the Collector of Kámrúp represented to the Commissioner of Assam that Bengal wood-cutters had found their way to his district, in search of Sâl, after exhausting the Lower Assam forests by indiscriminate fellings. Instead of the then existing unauthorised cesses of ordinary fiscal officers, he recommended the levy of a tax of Rs. 15 per 100 logs. To ensure natural reproduction, a check on felling of young trees and the prevention of waste was proposed. In 1852, the Board of Revenue superseded this system, farming forest tracts for quinquennial or shorter periods without restrictions, leaving sylvicultural considerations to a period when forest areas were more cleared. This system was gradually extended to other districts with various modifications, till in 1868 the charge of forests was transferred to mauza-

dárs, and an Assistant Conservator was deputed to report on forest areas. In 1863, the deputation of such an officer was applied for, owing to applications for extensive grants for tea cultivation. This brief résumé is necessary as a prelude to timber history in Goálpára. In 1869, without restriction in locality, size, or quantity, Sâl was removed from this district at an average cost of 2 annas 8 pies per tree, this being estimated from the fact that an axe tax of Rs. 4-4 was levied, each axe (or holder) extracting 50 logs at 2 logs per tree. The same logs realised from Rs. 10 to Rs. 15 per pair. In 1874, Government charged Rs. 8 per Sâl tree, and depôt sales reached from 12 annas to Re. 1 per cubic foot. At this time the Bengal Conservator estimated the Goálpára forest areas to contain 2½ millions trees, or an annual yield of 25,000, but the Assistant Conservator reported "mature timber has been worked out of these forests, since they are, comparatively speaking, very accessible to the great timber markets in Bengal. No large income can be expected from these forests for years to come," and no timber works were to be carried on.

76. Forest matters were somewhat chaotic and hazy till the promulgation of the rules, dated the 16th September 1876, when the distinction between reserves and open forests was emphasised, no royalty being levied in the latter for fuel, grass, bamboos, or other minor produce, nor for trees, except 29 specially notified, nor for timber on land assigned for cultivation. The number of reserved trees was reduced by Circular No. 43, dated the 10th August 1877, to 12, whilst rubber-yielding trees, or such as contributed to the propagation of the silk-worm and lac-producing insect, were added, and rates were fixed for timber on tracts allotted for special cultivation. It is not necessary to enter further into the development which experience has necessitated for the improvement of the administrative machine.

77. In 1875-76, only 56 first-class standing trees were sold for conversion into dugouts for Rs. 192, and it was estimated that 20,000 cubic feet of dead wood had been removed, though only 517 cubic feet were paid for. In the following year 113 trees were similarly sold, as were 21,813 pieces of dead wood. The Department commenced work this year, and felled 166 trees. Appendix D, already referred to, furnishes particulars for subsequent years.

78. The erratic character of these figures demonstrates how dependent these forests are on a fluctuating export demand. Facilities and encouragements have been offered in all directions, but demand alone has affected the yield, and that demand is dependent, as elsewhere stated, solely on foreign requirements. To the close of 1878-79 the Department carried on operations directly, felling 557 Sâl, 943 first-class, and 106 second-class trees, converting Dhubri into a depôt for Assam generally. Various estimates for expenditure and the results of special sales afforded satisfactory conclusions, omitting, however, reference to stock in hand, deteriorating and unsaleable. At the close of this year it was found that a return of only 1·22 per cent. was received on capital expended, and further efforts were abandoned till 1889-90, except infinitesimally small sporadic ones for special purposes. The depôt was not actually cleared till 1882-83.

79. The encouragement of private enterprise received early attention. Depôts were selected for stacking of purchaser's timber, free of the objectionable *thaljat* impost, a levy for privilege of stacking on private lands, as early as 1877-78. In the following year, the system of making half, in lieu of full, payments in advance was introduced, but the rate for other than Sâl trees converted into boats was raised to Rs. 10 each, remaining at Rs. 6 when not so converted. In 1880-81, this was enhanced to Rs. 20 for *Shorea robusta*, *Artocarpus chaplasha*, *Michelia champaca*, *Cinnamonum glanduliferum*, which had the immediate effect of depressing this particular industry, necessitating retraction of the order, though it was still partially enforced in the succeeding year, until a revised list of trees with fixed values was published. The depressed condition of the trade in 1885-86 induced a further concession in regard to advance deposits, and one-fourth royalty only was realised on all demands above 20 trees. The depression was intensified by vexatious *thaljat* contentions of the previous year, leading to court decisions adverse to the interests of the lumbermen. In 1886-87, the trade assumed brighter aspects, the growth of the succeeding years to 1889-90 being abnormal, due to prosperous Bengal harvests for these years, but it was understood at the time that the inflation of trade was temporary. A system of so-called improvement fellings was instituted in 1888-89, when inferior, badly-grown timber was removed at Rs. 2 per log extracted. Not properly supervised, both financial and sylvicultural necessities caused the abandonment of this system in 1890-91. In the same year, when the greatest demand ever made on these forests was in operation, the Inspector General of Forests visited the forests, and the high retail sale values, combined with a faulty sylvicultural system of selection, again caused the question of departmental operations to be mooted, and they followed, as a matter of course, in 1889-90. It is not necessary to follow purchaser's operations further, as nothing interesting nor special is connected with the existing depression beyond remarks already made, and the fact that the provisions of the working plan have acted as a deterrent.

80. Though the table shows the extraction from unclassed State forests separately, these may be consistently taken into consideration with reference to the working plan, as the areas thus classed, in earlier years at all events, are now constituted as portions of reserved forests.

DEPARTMENTAL OPERATIONS.

81. In operations of this description, where fellings take place in one season, floating in another, and where sales are spread over a series of years, the mere comparison of one year's figures with another would be misleading. Combinations from details now submitted are, therefore, used for comparative purposes. The work commenced in 1889, and has proceeded erratically but without interruption since. There has been much difficulty in rescuing the earlier years' figures from the chaotic, inaccurate returns filed, many of which are missing, whilst others disagree. The following tables claim approximate accuracy.

82. Receipts in forest depôts have been—

Year.	Number of trees.	Number of logs.	Cubic contents.	Remarks.
1889-90 ...	350	707	17,262	The figures for 1892-93 are for 15 months.
1890-91 ...	316	574	8,501	423 trees not included in 1894-95, as they are a portion of an incomplete contract.
1891-92 ...	1,624	3,279	50,020	
1892-93 ...	886	1,765	31,950	
1893-94 ...	492	1,152	18,889	
1894-95 ...	70	168	2,290	
Total	3,738	7,645	128,912	

All this timber has reached sale depôts, and on remeasurement there was a loss of 7,047 cubic feet.

83. Expenditure incurred on this work is exhibited in the following table :

Particulars.	1889-90.	1890-91.	1891-92.	1892-93.*	1893-94.	1894-95.	Total.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Felling and conversion.	1,255 12 0	1,726 0 0	1,879 0 0	3,513 8 0	60 0 0	1,510 0 0	9,744 4 0
Floating to depôts.	1,525 4 0	1,634 6 3	1,182 0 0	4,783 2 0	4,119 13 6	1,725 8 0	15,050 1 9
Handling at depôts.	19 8 0	4 0 0	274 10 0	11 0 0	21 0 0	...	330 2 0
Clearing depôts	...	...	82 12 0	27 0 0	...	2 0 0	111 12 0
Dragging gear...	33 0 0	30 8 0	30 6 0	41 6 0	26 12 0	2 0 0	164 0 0
Establishment	...	31 14 3	44 0 0	65 2 0	48 0 0	60 0 0	249 0 3
Total ...	2,833 8 0	3,476 12 6	3,492 12 0	8,241 2 0	4,275 9 6	3,299 8 0	25,619 4 0

*The figures for 1892-93 are for 15 months.

84. To bring this table into harmony with its predecessor, it is necessary to deduct Rs. 870 paid for incomplete work, not entered above. It is also to be noted that all charges not directly bearing on timber extracted for sale purposes, have been carefully eliminated. Thus the cost of extraction of 121,865 cubic feet of timber at sale depôts comes to Rs. 24,749-4-0, which produces, an average of 3 annas 3 pies per cubic foot. Adding the incidental charges for elephants and supervision at 1 anna 1 pie per cubic foot, the cost to the Department has been 4 annas 4 pies per cubic foot.

85. A corresponding table for sale of stock gives the following figures :

Year.	Numbber of logs.	Cubic contents.	Value.
			Rs. a. p
1889-90	456	8,484	7,100 0 0
1890-91	116	2,318	2,132 4 0
1891-92	429	5,855	4,381 0 0
1892-93*	289	5,351	3,794 14 0
1893-94	1,575	25,480	17,152 14 0
1894-95	1,872	24,517	11,848 9 0
Total	4,737	72,005	46,409 9 0

*15 months.

86. This would give an average sale value of nearly 10 annas 4 pies per cubic foot, or a gain of 6 annas per cubic foot on departmental working, *i.e.*, about 50 per cent. more than is obtained from *daffadrs*.

87. A summary of the above working is as follows :

	Logs.	Cubic feet.
Sales to date	4,737	72,005
Stock at sale depôts	2,771	48,406
Used departmentally	129	1,211
Sold locally	7	228
Missing	1	15
Total	7,645	121,865

88. Existing stock on the 1st December 1895 is—

	Logs.	Cubic feet.
At Sale depôts	2,884	49,594
At Forest „	2,984	28,154

89. Sale values have been affected of recent years by the condition of old stock, that finally disposed of in 1894-95 only producing 6 annas per cubic foot. The fact that work stretches over two seasons; that the timber is roughly handled in both elephant dragging and floating distances of about 50 miles; that it is exposed to wind, rain, and sun in depôts for indefinite periods, causing irregular rotting of sapwood and the numberless seams, the result of the expression of the hydrostatic

water ; competition of local timber-workers ; combination of touts at sale depôts, and the absolute impossibility of gauging the market, present or prospective, all militate against the extension of departmental working. The trade itself is further hampered by the fact that labour is from 50 to 100 per cent. higher than it was ten years ago, that there is no change in the primitive mode of extraction or floating, that the fall in the selling rates is not less than 20 per cent., and that there is no local demand for tea gardens, or railway requirements. For the latter one might be originated by offering inducements to contractors, but such inducements would necessitate accepting Rs. 4 or less per tree, instead of an average of Rs. 10. For the Department to undertake railway supplies would, under existing circumstances, without doubt end in financial loss.

SYSTEM OF FELLINGS.

90. There are no clear or regeneration fellings, which are strictly "selection," as prescribed by the working plan in the case of Sâl, and for other timber by a rough plan whereby trees are not felled till mature, that period being supposed to be arrived at when trees are 4½ feet in girth. The ordinary sylvicultural rules are respected in such cases. These latter fellings have been described as "unregulated" in recent annual reports. Improvement and coppice fellings are no portion of the present programme.

91. The following figures are interesting as indicating the average yield of Sâl trees, in cubic feet, that have been actually measured :

Range.	Departmental work.			Purchaser's work.		
	Number of trees.	Cubic contents.	Average.	Number of trees.	Cubic contents.	Average
Western	2,421	84,699	34·98	2,449	118,303	47·38
Eastern	1,799	50,091	27·85	1,859	87,781	47·22

92. The trees in the Western are much finer specimens than in the Eastern range, whilst the purchaser gets a larger yield than the Department, as he extracts in small lengths, the departmental greater lengths being due to the necessity of not entering into competition with purchasers.

METHOD OF EXTRACTION.

93. The method of extraction by permit-holders is as follows :

Marked trees are felled very early in the year with the axe, the bole cut into logs from 6 to 7 feet in length, and these are well

dressed, the only implement used being the axe. These are then rolled longitudinally along paths to river banks, where they remain till floating is possible, which is usually near the close of the rains, when no danger from floods is anticipated. They are then attached in parallel lines to each side of canoes, which can usually accommodate about 16 only at a time where they first leave the forest, but the number depends on the size of the boat and the depth of the water. In the case of canoes, these are hollowed out with the axe *in situ*, dressed similarly, and are charred to assist stretching and opening out. Rollers of green saplings are then laid along the regular paths, over which the boat is slid to the water.

DEAD WOOD.

94. Dead wood is a prominent feature in Appendix D, and is not only the result of trees killed outright by inundations, suppressed by more vigorous rivals, prostrated by windfalls, etc., but is largely composed of remnants of trees already felled. It is chiefly produced in the form of poles, principally of Sâl, for which there is a large demand at all times, but in this form it has to enter into competition with fellings from private forests. In these immense areas of densely-packed Sâl, there are numberless natural deaths in the immature state of the tree, and it is unfortunate that floating facilities do not admit of keener competition with private owners. The only other timber extracted in this manner is *Dalbergia Sissoo* in *dhums*, the result of deaths caused by inundation and prolonged submergence. The Sankos, Hel, and Champamati rivers are responsible for most of this timber. On the Sankos this description of forest is being wholly killed out.

DRIFT TIMBER.

95. Though much timber is killed by floods, it is almost wholly extracted as dead wood, as obstructions do not admit of such timber being floated any distance. What has usually been extracted in this form is "waif," the result of previous year's fellings, which have been overlooked in extraction.

BHUTAN TIMBER.

96. Imports from Bhutan are older than the division, but are on an insignificant scale. The hills in the immediate vicinity of the district have been denuded of most of the valuable timber, possibly due to heavy extractions in a remote period. A very simple system exists, by which wood-cutters pay Rs. 5 per axe for the season and Rs. 4 for each party, with certain small sums for the appeasing of sylvan demons or deities, and for the favour of the revenue collector. These sums are not constant, depending on the lessee who farms the forest from the Bhutan authorities. A small quantity of rice, usually 5 seers per wood-cutter, forms part of the revenue collection. To prevent fraudulent use of the import system, Government levy a small fee of 8 annas per boat and 4

annas per log on all imports, which have to be detained on the boundary till marked and passed. These rules came into force on the 1st October 1880, with a slight modification in Notification No. 24, dated the 28th June 1888, and are repeated in Notification No. 610, dated the 22nd February 1895.

97. The imports are exhibited in the following table:

Description.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
Logs	168	80	29	...	363	1,043	363	57	...	...	299	136	422
Dugouts ...	230	146	30	63	303	684	303	222	315	497	289	208	107

RUBBER.

98. Since statistics of any sort were kept, rubber imports from Bhutan and exports from the province, are shown in the annual reports. But there are not, nor have there ever been, except perhaps an isolated tree or two, any rubber trees in this district, so that local yield has had no share in the exports. It is more than doubtful whether the frontier in the vicinity of the district ever yielded any. The system of sales to merchants at established places made Goálpára in old days one of the important seats of the trade, where steamers constantly called, and the boat traffic was the most considerable in the province. Thus much of the rubber from the Kámrúp frontier reached this district, and it is useless to furnish statistics. The recent rules (Notification No. 5737R., dated the 1st November 1892) under the Assam Forest Regulation, establishing definite stations for declaration and payment of royalty at Rs. 12 per maund, have necessarily left little for declaration in this district.

FREE GRANTS OF FOREST PRODUCE.

99. These are also exhibited in Appendix D. They are necessarily the roughest of estimates, though much pains have been taken in recent years to improve their value. They are issued partly by virtue of Local Government concessions, but chiefly in this district by executive orders in return for work. In the first case, quantities are allotted by the Local Government from unclassed State forests only, without payment, which may be increased for reasons given. In the earlier days mauzadárs entered the full quantity sanctioned on all permits issued, whether required or not, or extracted or not. It is only of recent years that attempts at accuracy have been made, for, when first mooted, villagers naturally thought they would forfeit balances by not taking permission to remove full quantities sanctioned at once.

100. In the second case, a regular scale is laid down by the Divisional Officer of produce to be granted in return for labour. Reserves wholly supply these requisitions, but it is not often that limits permitted are availed of, for which excesses are always allowed in succeeding years. The system usually exacted a return of eight days' work in the year, but efforts have been made of late to make definite quantities of produce represent definite quantities of work. The Mech, not given to calculation, cannot see the benefit of this system despite endless explanations, so success is very gradual. Were it not for this source of labour the work of the division would be an impossibility, without extensive importation and prohibitive cost. As matters stand, the forests are improved by the removal of much valueless material, and the work compares favourably for cost with any division in the province.

REMOVAL OF PRODUCE BY RIGHT-HOLDERS AND UNDER PRIVILEGES.

101. No right-holders exist, the Local Government concessions being privileges limited to ten years in the case of raiyats. The Public Works Department has also received the privilege of satisfying their requirements free of cost along definite belts of road, whether passing through reserves or not. The Divisional Officer is strongly opposed to the rules as at present existing and understood, and considers they amount to alienation of reserved areas, which does not come within the power of Local Governments.

IMPORTS AND EXPORTS.

102. This is practically confined to exports, the collection of statistics, registration fees and royalty on which are regulated by existing rules under the Assam Forest Regulation, Notification No. 610, dated the 22nd February 1895, but were originated in Notification No. 20, dated the 10th August 1880, and were subsequently modified and expanded. Two check stations were established, one on each bank of the Brahmaputra, *viz.*, Dhubri and Fakirganj. The levying of royalty on bamboos and cane was only sanctioned in Chief Commissioner's Notification No. 18, dated the 13th April 1883, whilst that on reeds and thatching-grass was only enforced in Notification No. 6, dated the 25th January 1887.

103. The exports of the various years since the institution of the check stations for Government and private forests separately, appear in the following table:

Year.	Boats.		Logs.		Posts and pieces.		Bamboos.		Canes.		Reeds.		Thatching-grass.	
	Government.	Private.	Government.	Private.	Government.	Private.	Government.	Private.	Government.	Private.	Government.	Private.	Government.	Private.
1881-82 ...	...	...	...	...	...	...	3,600	...	215,911	...	39,942	800	6,422,300	647,800
1882-83 ...	...	...	...	...	...	...	2,100	...	394,850	100	106,342	515	7,370,000	3,150,500
1883-84 ...	985	25	9,873	3,752	30,356	226,326	6,544	...	225,570	39,890	30,678	2,706	922,222	121,244
1884-85 ...	326	9	37,113	27,303	3,104	209,953	9,900	...	88,379	7,200	29,350	800	311,511	54,666
1885-86 ...	577	49	27,702	23,573	8,679	309,501	22,330	...	327,424	19,935	75,676	9,300	613,011	178,583
1886-87 ...	823	4	13,786	14,410	30,217	320,868	21,920	4,500	273,779	65,870	82,080	2,800	816,388	488,668
1887-88 ...	1,393	8	21,912	10,169	36,160	296,431	20,917	...	229,835	49,600	43,416	20,923	1,012,551	701,101
1888-89 ...	2,125	2	39,067	31,057	6,480	299,305	12,304	10,600	193,607	63,810	44,397	13,995	725,151	761,943
1889-90 ...	1,790	7	67,094	26,133	14,117	311,262	9,100	6,100	370,351	58,412	29,280	17,524	1,009,206	799,550
1890-91 ...	1,749	40	50,259	15,060	11,965	313,772	7,200	14,200	633,309	66,567	82,632	21,083	2,514,804	1,089,670
1891-92 ...	1,035	7	26,605	10,703	8,126	337,861	250	20,600	325,465	27,800	43,876	14,017	1,793,412	936,278
1892-93 ...	2,602	28	39,474	9,242	8,433	355,111	17,842	7,300	783,489	25,625	36,068	20,606	1,081,188	672,660
1893-94 ...	2,787	25	26,283	7,186	6,256	296,108	2,950	11,778	734,836	103,100	86,375	30,220	797,200	633,389
1894-95 ...	1,880	6	21,551	8,551	7,310	310,712	887	17,520	587,708	22,333	37,162	33,920	1,271,518	1,005,726
Total ...	18,062	210	380,767	189,148	171,223	3,537,190	136,744	91,506	5,434,553	550,242	617,654	192,206	26,060,562	11,100,668
Average ...	1,505	17½	31,731	15,762	14,269	296,099	9,767	11,450	388,182	42,326	44,118	13,729	1,940,397	792,901
Second average	1,505	17½	31,731	15,762	14,269	298,038	9,767	6,568	388,182	39,803	44,118	13,729	1,940,397	792,901

104. The first average deals with figures only for years of actual working, the second for the whole period since rules were instituted. In addition to the above a small quantity of drift wood and charcoal is exported, but is too insignificant to call for any special attention.

105. The striking feature in these figures is their variability following, as they do, the periods of agricultural depression or affluence in Bengal. The registration of boats, logs, posts and pieces only commenced in 1883-84, and of bamboos, canes, reeds, and thatching-grass two years earlier. All produce exported finds a mart in Eastern Bengal, and is not carried further.

BOATS.

106. Taking details, it will be observed that the majority of the boats came from Government forests, Central and Lower Assam, with the Gáro Hills, being the main source of supply. The timbers used are Sâl and most of those designated as "first class," as they are large in size, elastic, easily worked, buoyant, and durable. As private forests now exploited only produce small timber, the number of boats extracted from them is small.

LOGS.

107. These are mainly 6 feet *dhums*, used for boat-building in Eastern Bengal. Steamer competition has undoubtedly interfered with the expansion of this trade, as well as the share now taken in the general traffic by boats all the way from Mozaffarpur and other Upper Bengal districts. A little larger-sized timber exported of late years, the result of departmental workings, has been used for buildings, bridge-work, etc. But Nepal and Bengal produce much larger timber, are more accessible, and can work cheaper for railways, or the general industrial mart. With the exception of one year there has been a steady decline in export of logs since 1889-90. The private forests worked for this description of timber are those belonging to the Goálpára zemindárs, a little also being done in Kámrúp. The Government forests worked are those of the Nowgong, Kámrúp, Gáro Hills, and Goálpára districts. The timber is almost exclusively Sâl, and as private forests are worked without method, their supply is decreasing, but will last for a considerable time yet.

POSTS AND PIECES.

108. These are usually the result of dead Sâl wood collections in Government forests, and of fellings of immature trees and saplings from zemindári forests. The former are furnished by the various Sâl-producing districts, and the latter by Goálpára private forests. The posts are exported to Eastern Bengal, and supersede bamboos as house posts. This is a steadily developing trade, though the last two years are exceptions. Private forests will always be the main source of this supply, as immature fellings are not permitted in Government forests. Further, private forests are more accessible and advantageously placed,

whilst Government dead wood is correspondingly more difficult in exploitation. It is quite possible that in earlier years a certain quantity of private timber was declared as Government timber, as the Bijni domestic disturbances caused seizures and interference witht raders, who protected themselves as they could. The timber is almost exclusively Sâl.

BAMBOOS.

109. The bamboos exported (omitting those from the Gáro Hills, which do not pass this traffic station) are chiefly cultivated ones, cut from old village sites, etc., such as the *Bambusa tulda*, *B. balcooa*, and a certain number of the *Dendrocalamus Hamiltonii* found in most forests in the valley and hill districts. From Government forests there has been a regular decrease since 1885-86, except in 1892-93, when the private forest supply fell off. Kámrúp supplies most from Government forests, and Goálpára from private forests, the destination being Dacca and Serajganj chiefly.

CANES.

110. These are exported on a very large scale, and it is clearly a developing trade. In addition to its use for manufactures for domestic requirements, it is replacing in Eastern Bengal the jute used in tying framework of roofs, etc. The source of private supplies are mainly some Gosain estates in the Sibságar district, whilst Lakhimpur and Sibságar supply by far the greater portion of the Government forests exports, though each of the other districts furnishes its quota.

REEDS.

111. In these, there is also a healthy trade. As a rule, but one description (*Saccharum sp.*) is exported, and is used for walls of houses, fish barriers, etc. The zemindári estates in Goálpára furnish the supply from private forests, that from Government forests being extracted from the Goálpára and Kámrúp districts. Their destination is generally the five Eastern Bengal districts.

THATCHING-GRASS.

112. The exports of thatching-grass vary very considerably. In an exceptionally wet year, or very early cessation of the rains, the grass decomposes. An exceptional influx of boats for general trade purposes also affects this export, as they return with thatching-grass when disappointed in obtaining oil seeds, lac, timber, etc. Kámrúp and Goálpára furnish the Government forest supplies, and the zemindári estates in Goálpára the private forest supplies, the destination in both cases being chiefly the Rangpur, Bogra, Pubna, and Mymensingh districts. There has been a steady decrease in export since 1890-91, but that was a very favourable year.

113. The proportionate percentage of exports from Government and private forests, appears in the following table :

Description.		Government.	Private.
Dugouts		98·85	1·15
Logs		66·81	33·19
Posts and pieces		4·56	95·44
Bamboos		59·89	40·11
Canes	Bundles	90·80	9·20
Reeds	„	76·27	23·73
Thatching-grass	c. ft.	70·71	29·39

114. Except in posts and pieces, Government forest exports still exceed those from private forests, but the proportion has decreased of late years under all heads, except dugouts and logs, the excess in the latter cases being explained under remarks concerning them, as is the decreased proportion of posts and pieces. In the remaining cases there are various reasons, such as rates lower than those exacted by Government and more favourable positions occupied by zemindári estates on the Brahmaputra. In the case of thatching-grass and reeds, it is also possible that Government forests are made to suffer to the profit of private estates, as extractions are not made under cover of a permit, royalty being levied only on what is produced at the traffic station. In the interim zemindári underlings can issue passes at reduced rates, and our establishments are not sufficiently strong to cope with all such cases. Special steps will be taken in that direction this year.

115. Canes and reeds are exported in bundles of ten, whilst thatching-grass is measured by the cubic foot. In the more important districts the cane *mahals* are sold by auction, so little revenue is derived from that source at the registering station.

116. These figures indicate, perhaps better than any others, the pulse of the trade. The most conspicuous item is that of "Posts and pieces," in which direction private forests hold an immense advantage, their proximity to the Brahmaputra and the practical absence of any regulated system of fellings, with light dues, contributing to defy competition. But this very system or want of system encourages deterioration of the forests, though it would be idle to speculate on the ultimate disappearance of the same, Sâl coppicing so freely at the stage where fellings are favoured. On the other hand, this secures to Government the monopoly of all large timber.

117. Vagaries in the advance of exports from private forests exceeding those from Government forests in recent years, are possibly

due to faulty registration in the first instance, when no fees or royalty being levied, it suited exporters to declare produce as from Government lands to avoid interference from private owners. The levy of fees has reversed the case, and thus private owners have gained enormously, Government incurring all the expense of the check causing the change. Steps have been taken, and recommendations submitted, to re-adjust the present arrangement.

118. The receipts from the traffic station have been as follows :

Year.	Amount. Rs. a. p.
1880-81	705 8 0
1881-82	947 10 0
1882-83	939 0 0
1883-84	1,757 0 0
1884-85	395 0 0
1885-86	297 0 0
1886-87	212 13 0
1887-88	4,090 6 9
1888-89	3,536 3 0
1889-90	3,762 0 0
1890-91	8,301 0 0
1891-92	6,502 0 0
1892-93	4,510 12 9
1893-94	3,831 12 9
1894-95	5,099 6 6
Total	44,887 8 9

CHAPTER IV.

FINANCIAL RESULTS.

119. Revenue and charges are appended in tabular form for each year as Appendix E to this report.

REVENUE.

120. These figures show a fluctuation almost in cycles of years, but even the disastrous experiences of recent years are not below the average. The causes given in annual reports are synthetically comprehended in the well-worn phrases "stagnant" or "buoyant trade." In paragraph 74 of this report, some of the reasons for the limited demand on these forests are given. To these may be added that railway and business centres are either remote or can be catered for on more advantageous terms, that there are no tea gardens (except two very small ones) needing fuel or tea-box supplies, that the soil is unsuitable for tea growth and revenue from timber on waste land grants thus not forthcoming, that neither silkworms nor lac are

cultivated, except to a very small extent, on *Ricinus communis* in the former case, that there is neither rubber nor *agar* in the district, that canes, piper, etc., are not in sufficient abundance to make working profitable. The trade is exclusively a timber one, and even that is really limited to Sâl, as restrictions would have to be put on any great demand for other first-class timber. The manufacture of canoes, too, has never been a favourite occupation in the district. Facts must be faced, and until transport facilities or reduced incidental charges are provided, the trade cannot develope from its normal, apathetic condition. Granting these concessions even, it would take time to make them productive. It is impossible to gauge the future, for, as far as can be gathered from records, none of the trade barometric eccentricities were anticipated, except on one occasion.

121. Taking each year's figures, the small receipts for 1875-76 were owing to the fact that, except 29 trees, forest produce of every description was free even for trade purposes. The large sale of dead wood contributed the succeeding year's excess, and the Conservator considered this description of produce to be worked out. In 1877-78, a combination of departmental operations and sales of standing trees to purchasers produced nearly Rs. 5,000 less than the previous year, but this may be partially attributed to the difficulties experienced in commencing departmental operations, and in organising a system for voluntary workers. Further, *thaljat* difficulties naturally assumed shape when private owners found competition facing them. There was a further falling-off of over Rs. 4,000 in 1878-79, when the Rangpur District Engineer and Dhubri Executive Engineer found it cheaper to obtain squared teak from Calcutta for their requirements; a diminished supply of dead wood is also given as a reason for the reduced revenue. In 1879-80, the increase of revenue approached Rs. 12,000, and was partly due to sales from Government depôts, and partly to increased work by lumbermen. For some time previous to this other divisions floated a quota of their supplies to Dhubri, which became a general depôt, and benefited by the receipts till 1882-83. In 1880-81, the division made its first surplus, and continued making one till 1884-85. The increased revenue of the year, about Rs. 16,500, was partly due to excess royalty levied on first-class boats, incorporation of Gáro Hills revenue, introduction of Bhutan and Assam River Rules, and partly recovery of outstandings of the preceding year, a system of partial payments having previously been introduced, which continues to the present day, and thus somewhat obscures each year's actual results. Purchasers' transactions in both standing trees and drift were largely increased, for there was a small decrease in depôt sales. Looking at these figures now, it is clear that the cycle of prosperity had commenced, and it would be interesting to know what teak produced during this cycle and what special marts or industries in connection with timber were inflated at the time. In 1881-82, the revenue again advanced by a leap, approaching to Rs. 11,000, equally distributed amongst departmental sales and voluntary operations, though the Gáro Hills forests were formed into a separate division, and the Rs. 20 rate reduced to Rs. 10 on first-class boats of four descriptions. Further, pass fees at Dhubri check station, which realised Rs. 1,198

from October 1880 to November 1881, were abolished. A further bound, approaching Rs. 16,000, was the result of operations in 1882-83. Depôt sales fell very slightly, but all stock was cleared off, and departmental working ceased till 1889-90. The increase was thus wholly to be attributed to voluntary effort, but this series of increases seemed to somewhat alarm the Conservator, who prognosticated somewhat nervously that continuance was not to be anticipated. There is reason to believe that teak prices ruled high this year. In 1883-84, there was a reduced collection of over Rs. 25,000, of which departmental operations accounted for nearly Rs. 12,000, and lumbermen's work for the balance. The new arrangement of reserved trees and fixed prices came into force this year. The market was evidently glutted. Poor results characterised the next three years, and here too lies food for enquiry. Did the market continue glutted, was any industry associated with timber specially distressed, or was there agricultural depression in Eastern Bengal? The revenue fell another Rs. 20,500 odd in 1884-85, which can only be definitely attributed to trade stagnation. In 1885-86 there was a small increased collection of Rs. 2,600, but this was more apparent than real because little more than half as many trees were felled in this year as had been felled in the previous one. Further, *thaljat* claims not made for the previous six years were admitted by a court this year, and the piper being paid by the lumbermen affected trade somewhat. In 1886-87 there was a further increase of Rs. 1,500, but like the preceding year, excessive recovery of outstandings contributed to paper results. This year, too, witnessed the gazetting of Dhubri and Fakirganj as traffic stations, and the imposition of royalty on thatching-grass and reeds exported from the province. In 1887-88, trade again made a forward movement, the results being Rs. 21,400 in excess of its predecessors. Again, a surplus balance was shown, the three previous years exhibiting deficits. The year's excess was made up of sales of standing trees principally, and to a smaller extent of increased receipts from exports of minor produce and imports of Bhutan timber. Nearly Rs. 28,000 represented the increase of 1888-89 over the previous year, all due to voluntary effort in extraction of Sâl, as decreases were visible in most other extractions. The inflation continuing, the increased results of 1889-90 amounted to over Rs. 34,000, the collection being the greatest on the division's record, Rs. 1,01,915-14-9. Departmental operations having recommenced contributed Rs. 7,100 out of this, the excess again being almost exclusively Sâl extractions by purchasers. Nearly Rs. 29,000 represented the following year's decreased collection, standing timber falling to the extent of Rs. 35,000, exports of minor produce and miscellaneous revenue showing an increase. These three years represented another prosperous cycle, nor has this been satisfactorily explained. In 1891-92, the revenue fell by Rs. 23,000, though there were small increases under departmental and drift operations. Trade stagnation was not alone responsible for this, as Rs. 31,220 were recovered in the form of outstanding revenue during the previous year. Further, the stringent adoption of working plan prescriptions and alterations in system of charges for timber somewhat affected results, and these conditions still apply, though opposition is modified and not so intense. This year

commenced a deficit, which has continued to date, except for a small surplus in 1893-94. In 1892-93 collections were slightly increased, the extent being about Rs. 3,300, but these figures included fifteen months. There were reduced departmental sales and receipts from minor produce and drift, but standing trees extracted by purchasers, Bhutan imports, and miscellaneous revenue more than compensated for these. In 1893-94 there was a further increase of over Rs. 7,000, wholly due to departmental sales of stock, every other sub-head showing a decrease. The large departmental sales were abnormal, and were made to meet local public works demands. In 1894-95 decreases commenced again, Rs. 15,500 odd being the figure of the reduction. But these figures were seriously affected by the exceedingly small sum recovered in the form of outstandings, which had almost reached its vanishing point, and further still by the fact that standing Sâl trees sold to purchasers paid no preliminary deposit. Departmental sales were considerably affected by reduction of rates per cubic foot, to secure clearance of old and deteriorating stock.

CHARGES.

122. Taken as a whole, except where extraneous charges like the cost of Imperial Forest Survey operations are concerned, all expenditure has been normal, increases being due to establishment charges and promotions, and such improvements in regular management and protection as altered conditions demanded. But the conspicuous part "free labour" plays in this direction cannot be ignored, for, without it, cost of demarcation and fire-protection would be trebled. Further, this labour is practically enforced, is an extremely unpopular institution, is diminishing by sickness and removals, and takes every opportunity of evading responsibilities. Its management strains the tact, to the utmost limit, of supervising officers, as petitions to the civil authorities have to be avoided as far as possible, and satisfactory explanations must be ready on all occasions. This form of labour cannot last; increased wealth and prosperity of cultivators will render them independent and will enable them to pay for their requirements. This would necessitate importation of labour, unsuitable and costly, for though it (labour) leaves this district in large numbers for periodical work in tea gardens further up the valley, it looks upon all labour for Government as the mark of the beast, "*begar*," the sign of a degraded condition. Terms as good as they can receive outside have been offered them, and contingencies would be in their favour, but the repellent notion of "*begar*" drives them to a temporary abandonment of the domestic hearth, which is hardly natural to them. Other Government departments experience the same difficulty.

123. Organisation really commenced from 1875-76; that year's expenditure was necessarily almost exclusively incurred in establishment and its requirements, and was a mere preliminary canter. The following year charges increased by over Rs. 10,200, which followed on the lines of its predecessor in completing organisation and managing *materiel*, and making its first efforts in the direction of protection and improvement. Though the expenditure of 1877-78 was almost

identical, its subdivision was more varied, as greater sums were available for departmental operations, surveys, and fire protection. In 1878-79, there was an additional sum of over Rs. 5,000 expended, departmental operations, elephants' keep, an increase in subordinate establishment, and the temporary appointment of a Sub-Assistant Conservator, contributing to this. Nearly Rs. 8,000 represented the increase in 1879-80, all under A, as establishments cost Rs. 1,000 less than in the previous year. The expenditure was distributed over almost every sub-head, but particularly departmental operations, purchase and keep of cattle, and buildings. Survey expenditure up to this time included cost of valuation surveys and division of Sidli and Guma into compartments and blocks. Practically, departmental fellings ceased after this, subsequent expenditure during the next two years being subsidiary charges in connection with depôts. In 1880-81, the expenditure fell by Rs. 8,000, all under A, all sub-heads being more or less affected by the decrease. A further decrease of about Rs. 2,500 occurred in 1881-82, to be attributed to reduced charges for departmental operations and establishment, also to demarcation, of which little was done this year and only a portion in its predecessor, for want of labour. In 1882-83, expenditure was within a few hundred rupees of the previous years, but the balance was unequally affected, as the charges under A were diminished by nearly Rs. 4,000, and increased to an almost similar extent under B. Departmental timber charges almost ceased, buildings alone were reduced by Rs. 2,500, neither demarcation nor survey work was undertaken, and there was an excess of about Rs. 500 for fire-protecting the same area as in the previous year; the Divisional Officer was promoted, and the establishment charges increased. In 1883-84, the increased expenditure amounted to over Rs. 11,000, of which over Rs. 6,000 went to works. But of this sum, Rs. 3,900 were expended on elephants, the balance representing sums spent on work not done in the previous year. Again, in this year, a portion of the demarcation (13 miles) was not completed, and fire-protection cost nearly Rs. 1,700 in excess, though the area was reduced by nearly 8,500 acres. This was another year of promotion of controlling officer and increased charges for establishment. The reduced expenditure in 1884-85 was nearly Rs. 10,000, which was mainly due to no purchases of cattle being made, and to the posting of a junior officer to the charge of the division. In 1885-86, there was a further reduction of Rs. 2,000, the main decrease being under establishments, though vagaries exist under most sub-heads. In 1886-87, the expenditure was increased by over Rs. 3,000. Payments for compensation for compulsory taking up of timber depôts, due to court decisions in favour of "*thaljat*" demands in the previous year, and increased cost of fire-protection owing to addition of nearly 23,000 acres to the area, and increased establishment charges, accounted for the increase. The increased cost incurred in 1887-88 was only a little over Rs. 600, vagaries under various heads compensating each other; but temporary establishment was increased during the year. In 1888-89, the increase again only amounted to little over Rs. 700, but vagaries in sub-heads were again considerable, reduced charges on fire-protection and demarcation contributing to balance excess incurred, in recommencement of

departmental operations, in building charges and a small increased charge for temporary establishments. In 1889-90, charges were Rs. 28,000 odd in excess of the previous years, and the division bristled with excesses, due to the commencement of Imperial Forest Survey operations, extension of departmental operations, and its incidental charges for keep of cattle, etc., extensive building work, increased fire-protection charges due to an additional area of nearly 233,500 acres, and a senior officer in charge of the division. There was a further increase of about Rs. 4,000 in 1890-91, mainly due to further stimulus in departmental timber work, cost of purchase and keep of elephants, the decrease in building charges supplied the excess of survey demands, but cost of fire-protection increased by no less than Rs. 3,700, though less than 12,000 acres were added to the area. Controlling staff charges were considerably reduced. In 1891-92, the increased cost continued to the extent of another Rs. 5,400, due wholly to survey charges, Rs. 5,282 in excess, and fire-protection expenditure, Rs. 3,100 odd in excess, the surplus charge being accounted for by reduced cost of controlling staff, as the Divisional Officer had to go home on sick leave early in the year, and an officer holding another charge held the division for a portion of the year, and was subsequently relieved by a junior. In 1892-93, expenditure reached its highest limit, being Rs. 10,700 nearly in excess of its predecessor. The greater portion of this was due to the continuous employment of a separate Divisional Officer, his promotion, and the attachment of an Assistant Conservator to the division. Departmental timber working and its contingent charges swallowed up the rest of the excess and the considerable savings effected under fire-protection and surveys. The departmental timber charges were influenced by payments for work partially done three to four years previously. In 1893-94, charges fell to a more normal condition, though the extended retention of an Assistant Conservator still kept establishment charges in excess. The reduced charges of the year amounted to nearly Rs. 25,500, most sub-heads, except buildings, contributing. The main reduction was naturally in survey charges, Rs. 17,400 nearly, whilst fire-protection was reduced by nearly half. In 1894-95, the reduced expenditure was about Rs. 1,000, though under "Works" it was nearly Rs. 3,500, the balance being exhausted by officiating promotion of the Divisional Officer, and an Assistant Conservator being still attached to the staff. Under every sub-head but temporary establishments, there was a decrease, and this solitary exception was due to transfer from other sub-heads.

124. The result of 20 years' working of the division is as follows :

	Rs.
Revenue	7,19,443
Expenditure	6,02,511
Surplus	1,16,932

The value of live and dead stock at the close of 1894-95, was Rs. 30,165.

CHAPTER V.

FOREST ADMINISTRATION.

125. In the table below permanent and temporary establishments are not distinguished, as all are essential continuously to the working of the forests. It is unfortunate that men so employed should be placed on temporary establishments, as it obscures classification of charges :

RANGE.				CIRCLE.				BEAT.			
No.	Name.	Area, in sq. miles.	Officer in charge.	No.	Name.	Area, in sq. miles.	Officer in charge.	No.	Name.	Area, in sq. miles.	Officer in charge.
1	Guma ..	26	Forester ...	..	..	..	..	1	Gosaigaon	5	Forest guard.
								2	Machandoba.	8	Do.
								3	Barabadha	4	Do.
								4	Silai ...	4	Do.
								5	Singimari	5	Do.
2	Western	235	Forest Ranger. Head guard, office, Head guard, timber, Head guard, general.	1	Ripu ...	102	Forester	1	Sankos ...	51	Forest guard.
								2	Ripu ...	42	Do.
								3	Pachadavir	9	Do.
				2	Chirang	133	Forester	1	Kochugaon	26	Forest guard.
								2	Charaidaka	50	Do.
								3	Atiabari ...	21	Do.
								4	Longa ...	36	Do.
3	Eastern	261	Assistant Conservator Head guard, office, Forest guard, office.	1	Saralbhanga.	205	Forester	1	Patgaon ..	176	Head guard.
								2	Bengtol ..	29	Do.
								1	Patgaon ...	80	Forest guard.
								2	Lungsung	96	Do.
								3	Bhur ...	9	Do.
								4	Dangsibari	13	Do.
								5	Kakragaon	7	Do.
				1	Sidli ...	56	Forester	1	Garubhasa	29	Forest guard.
								2	Haltugaon	27	Do.
4	Bijni reserve.	196	Forester ...	..	..	..	...	1	Sovaijhar	90	Forest guard.
								2	Makra ...	106	Do.

126. The Bijni reserve, needing so little attention, is not treated as a distinct range. The size of charges is regulated according to responsibilities and working requirements. The position now occupied by an Assistant Conservator is that which usually devolves on a Forest Ranger.

127. In addition to the above are—

(1) Permanent office establishment.

(2) Temporary depôt establishment.

(3) Temporary patrolling establishment.

(4) Temporary check station establishment.

128. Appendix F gives details of these establishments and their annual cost. The cost of the establishment enumerated in the above table is Rs. 9,864 per annum. Except the controlling and office staff, all subordinates are in uniform, the lower grade since 1878-79 and the upper since 1889.

129. For fire-protection purposes, a separate establishment is entertained, whose tenure of appointment depends on the season. The average number required during the last four years has not exceeded 60, against 160 of the previous three years. Extent of beat is necessarily irregular to suit conditions of personal safety, to places demanding excessive supervision, or being isolated.

130. It may be of interest to furnish a table of the different Divisional Officers who have held charge—

	Name.	Date of assuming charge.	Remarks.
1	Mr. W. R. Fisher	7th December 1875.	
2	„ D. P. Copeland	15th September 1878.	
3	„ W. R. Fisher	16th December 1878.	
4	„ D. P. Copeland	1st April 1881.	
5	„ J. T. Jellicoe	3rd November 1881.	
6	Babu Jogesvar Sur	18th June 1884.	
7	Mr. D. P. Copeland	15th July 1885.	
8	„ A. J. Mein	14th October 1889.	
9	„ C. P. Fisher	1st April 1891.	
10	„ A. J. Mein	14th April 1891.	
11	„ C. P. Fisher	3rd May 1891.	
12	„ D. P. Copeland	12th May 1891.	
13	„ T. J. Campbell	16th November 1891.	
14	„ H. S. Ker-Edie	5th September 1894.	
15	„ T. J. Campbell	16th October 1894.	

131. Of late years, the division has been made the training ground for newly-arrived Assistants, and of Rangers about to be sent to Dehra Dun, the constant changes engendered thereby being detrimental to the division's interests.

T. J. CAMPBELL,

Deputy Conservator of Forests,

Goálpára Division.

Dhubri,

The 14th February 1896.

APPENDICES.

APPENDIX A.

Area Statement of Reserved Forests in the Goálpára Division.

As originally gazetted.					As modified.				
Name of Reserve.	Area, in acres.	Area (in acres) added per annum.	Notification.	Remarks.	Name of Reserve.	Area, in acres.	Total area, in acres.	Notification.	Remarks.
Bijni	8,039	..	No. 46, dated 20th Nov. 1875.	Were gazetted under section 2 of Act VII of 1865 and regazetted under provisions of section 34 of Act VII of 1878.	Guma	16,786	..	No. 7607R., dated 22nd Sep. 1893.	These areas comprise those "as originally gazetted," and were gazetted under their present names, under the provisions of section 17 of the Assam Forest Regulation, VII of 1891. Difference in area is due to corrections made by Imperial Forest Survey. (See pages 15-16 of Notes).
Chirang No. I ..	69,205	..	Ditto ditto ..	Ditto ditto.					
Ditto No. II ..	88,088	..	Ditto ditto ..	Ditto ditto.					
Ripu	41,635	..	Ditto ditto ..	Ditto ditto.	Ripu	150,587	..	Ditto ditto.	
Guma	15,779	229,746	Ditto ditto ..	Ditto ditto.	Chirang ..	148,261	..	Ditto ditto.	
Addition to Chirang No II.	2,560	..	No. 46, dated 3rd Sep. 1877.	Rule 8 of Assam Forest Rules and above.	Bengtol ..	14,335	..	Ditto ditto.	
Sidli	43,762	46,322	Ditto ditto ..	Ditto ditto.	Bhumeswar Hill..	4,180	..	No. 2382R., dated 2nd July 1895.	
Jengasi Charaidaka	1,730	..	No. 4, dated 17th Jan. 1880.	Gazetted under section 19 of Act VII of 1878.	Bijni	125,510	459,659	No. 3927R., dated 28th Aug. 1894.	
Atiabari ..	9,180	10,910	Ditto ditto ..	Ditto ditto.					
Bengtol and Darogaon.	7,470	..	No. 32, dated 25th July 1883.	Ditto ditto.					
Bhumeswar Hill ..	4,033	11,503	Ditto ditto ..	Ditto ditto.					
First addition to Bijni.	69,401	..	No. 14, dated 5th Mar. 1887.	Ditto ditto.					
Panbari Pachadavri	3,290	..	Ditto ditto ..	Ditto ditto.					
Bhur	3,855	76,546	Ditto ditto ..	Ditto ditto.					
Sankos ..	28,800	..	No. 13, dated 24th Mar. 1888	Ditto ditto.					
Muktaigaon ..	3,200	32,000	Ditto ditto ..	Ditto ditto.					
Second addition to Bijni.	22,540	22,540	No. 2736R., dated 18th Aug. 1890.	Ditto ditto.					
Addition to Ripu ..	3,420	..	No. 1666R., dated 17th Mar. 1893.	Gazetted under section 17, Assam Forest Regulation, VII of 1891.					
Ditto Jangasi Charaidaka.	582	..	Ditto ditto ..	Ditto ditto.					
Addition to Atiabari	4,013	..	Ditto ditto ..	Ditto ditto.					
,, Panbari Pachadavri.	142	8,157	Ditto ditto ..	Ditto ditto.					
Addition to Guma	608	608	No. 5926R., dated 2nd Aug. 1893.	Ditto ditto.					
Third addition to Bijni.	25,530	25,530	No. 3060R., dated 12th July 1894.	Ditto ditto.					
Total	456,862	456,862	.....	.....	.....	459,659	459,659	.....	

APPENDIX B.

Classified Statement of Forest Areas in Reserves, Goálpára Division.

Reserves.	Circles.	Pure Sál.	Mixed Sál.	Mixed forest.	Evergreen forest.	Sisu forest.	Khair.	Sisu and Khair.	Grass.	Other growth.	Rivers and swamps.	Fire-lines.	Miscellaneous.	Total.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Ripu ..	Ripu	19,973	10,276	20,538	..	2,241	..	1,068	7,763	3	3,153	519	..	65,534
Ditto ..	Chirang ..	27,383	15,598	11,161	8,250	252	5,066	4,372	8,391	..	4,441	139	..	85,053
Chirang ..	Saralbhanga ..	16,050	2,501	35,299	38,947	127	812	..	13,532	1,445	3,623	22	..	112,358
Bengtol ..	Ditto ..	5,065	44	1,886	..	102	..	..	6,666	..	557	15	..	14,335
Bhumeswar Hill	Ditto ..	1,015	..	2,393	..	..	..	..	639	59	74	..	..	4,180
Chirang ..	Sidli	22,710	50	3,422	..	..	..	..	8,123	92	1,470	36	..	35,903
Guma ..	Guma	12,033	..	595	..	..	..	..	2,020	280	1,745	113	..	16,786
Bijni ..	Bijni	..	..	38,510	6,000	..	..	11,000	70,000	..	..	..	..	125,510
	Total, in acres ..	104,229	28,469	113,804	53,197	2,722	5,878	16,440	117,134	1,879	15,063	844	..	459,659

APPENDIX C.

Statement showing Areas and Cost, attempted to be protected from fire, Goálpára Division.

Year.	Area attempted, in acres.	Area burnt, in acres.	Area saved, in acres.	Percentage of failure to area attempted.	Cost of area attempted.	Cost per square mile of area attempted.			Cost per square mile actually protected.			Total cost per square mile of area attempted from year to year.		
					Rs.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
1875-76	15,716	14,716	1,000	93·64	23	0	14	11	14	11	10	0	14	11
1876-77	42,925	22,709	20,216	52·90	626	9	5	4	19	13	0	9	10	11
1877-78	48,113	29,603	18,510	61·53	1,189	15	13	0	41	1	9	24	7	2
1878-79	48,113	46,413	1,700	96·47	1,175	15	10	1	441	11	8	40	1	3
1879-80	48,113	300	47,813	0·62	2,208	29	5	11	29	8	10	69	7	2
1880-81	59,833	593	59,240	0·99	2,196	23	7	10	23	11	6	79	5	3
1881-82	59,833	41,123	18,710	68·73	1,573	16	13	2	53	13	0	96	2	7
1882-83	59,833	28,489	31,344	47·61	2,439	26	1	5	49	12	10	122	4	11
1883-84	51,390	33,056	18,334	64·32	4,024	50	1	9	140	7	2	192	7	0
1884-85	51,350	1,192	50,058	2·51	3,661	45	10	1	46	12	10	238	3	10
1885-86	51,350	440	50,910	0·88	3,968	49	7	4	49	14	1	287	11	0
1886-87	74,326	1,688	72,638	2·27	4,862	41	13	11	42	13	5	240	10	0
1887-88	77,526	489	77,037	0·63	3,464	28	9	5	28	12	6	259	4	8
1888-89	177,506	12,235	165,271	6·89	4,484	16	2	7	17	5	9	129	6	7
1889-90	410,933	232,874	178,059	56·67	4,323	6	11	9	16	7	4	62	10	1
1890-91	422,549	42,930	379,619	10·16	11,563	17	8	4	19	7	10	78	6	9
1891-92	422,549	79,556	342,993	18·80	9,902	14	15	11	18	7	7	93	6	9
1892-93	431,329	3,938	427,391	0·91	6,938	10	4	8	10	6	3	101	13	0
1893-94	434,382	35,907	398,475	8·30	4,390	6	7	6	7	0	2	107	9	1
1894-95	459,661	207	459,454	0·04	3,960	5	8	2	5	8	3	107	2	8

APPENDIX D.

Fellings by Government and Purchasers and Free Grants during the financial years from 1875-76 *to* 1894-95.

Particulars.	1875-76.		1876-77.		1877-78.		1878-79.		1879-80.		1880-81.		1881-82.		1882-83.		1883-84.		1884-85.	
	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.	Reserve.	Unclassed State forests.
Government and Purchasers.																				
Sál trees	...	...	200	...	40	...	421	...	1,282	20	2,685	...	2,677	...	5,415	...	1,212	100	1,064	...
First-class trees	56	...	69	...	7	...	1,029	...	201	17	57	...	97	...	237	...	425	88	157	4
Second-class ,, ...	...	...	10	...	...	...	32	...	48	...	6	...	4	...	...	1	32	6	59	77
Dead wood, Sál	517	...	21,813	...	4,300	...	316	...	396	...	...	...	3,475	...	4,428	...	1,054	...	929	8
,, ,, other kinds ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	62	...
Dugouts, Sál	...	...	...	...	...	...	336	...	...	...	...	...	6	...	123	...	128	...	12	...
,, first class	...	...	...	...	...	...	18	...	...	...	...	...	...	...	...	...	...	...	...	...
,, second class	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dhuins, Sál	...	...	...	...	...	...	...	...	...	...	...	...	143	...	...	...	...	...	...	...
,, first class	...	...	...	...	...	...	...	...	...	...	...	...	619	...	...	...	...	...	...	...
,, second class	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poles or saplings	...	...	...	...	...	...	...	...	...	...	...	...	...	...	624	...	879	...	525	...
Bamboos	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,100	...	6,544	...	...	...
Charcoal	...	...	...	...	...	...	...	...	8	...	...	...	...	...	194	...	90	...	50	159
Canes	...	...	...	...	...	...	...	...	100	...	...	...	4	...	200	...	64,633	...	26,019	400
Firewood	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Free Grants.																				
Sál trees	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	335	...
,, saplings	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
First-class trees	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Second-class ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dead wood	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Firewood	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bamboos	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Fellings by Government and Purchasers and Free Grants during the financial years from 1875-76 *to* 1894-95—continued.

Particulars.	1885-86.		1886-87.		1887-88.		1888-89.		1889-90.		1890-91.		1891-92.		1892-93.		1893-94.		1894-95.	
	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.	Reserve.	State Unclassed forests.
Government and Purchasers—contd.																				
Sâl trees ..	476	3	2,048	16	4,507	187	7,825	284	6,637	172	2,432	6	3,391	11	1,954	..	380	48	1,334	135
First-class trees ..	137	20	437	55	421	25	480	43	903	66	1,085	37	583	6	275	42	637	23	1,079	46
Second-class ,, ..	68	29	44	84	217	35	247	81	312	157	217	112	109	61	89	282	34	97	56	49
Dead wood, Sâl ..	3,287	115	11,942	168	4,266	70	4,007	..	2,991	..	7,571	338	6,941	157	6,175	..	5,915	110	6,988	156
,, ,, other kinds.	..	..	..	..	..	..	..	..	..	..	..	..	106	1	..	324	244	1	1,051	..
Dugouts, Sâl ..	..	..	..	...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, 1st class..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, 2nd class..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dhuma, Sâl ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, 1st class ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, 2nd class..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Poles or saplings ..	100	..	20	..	40	..	210	..	491	..	993	..	22	..	..	..	..	..	..	..
Bamboos ..	..	..	..	..	..	..	..	..	..	25	..	..	..	..	..	..	..	150	50	387
Charcoal ..	484	..	52	..	169	..	325	16	866	53	384	18	96	4	186	..	128	22	95	24
Canes ..	400	10	2,550	8,250	400	185	736	500	1,225	425	900	..	900	..	600	..	..	16,481	..	9,200
Firewood ..	..	..	..	8	190	..	26	..	..	..	..	..	..	..	192	..	2,200	..	5,000	..
Free Grants,																				
Sâl trees ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,600
,, saplings ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	98	..	..	..	..	..
Other ,, ..	..	..	..	..	..	..	..	..	..	216	..	..	..	..	..	..	..	..	..	..
First-class trees ..	..	..	..	..	..	..	..	..	..	..	..	4	..	9	..	61	..	..	..	..
Second-class ,, ..	..	675	..	693	..	13,897	..	12,348	..	2,178	..	2,181	..	1,269	596	891	..	16,320	..	12,900
Dead wood ..	..	107	..	2,509	7,900	..	2,000	..	2,592	48	10,468	79	10,014	1,338	5,597	4	48,890	..	89,140	910
Firewood ..	..	120	..	371	87,775	603,557	145,200	518,940	84,903	94,084	164,670	95,477	151,384	69,597	35,119	20,424	183,252	66,000	131,084	40,150
Canes ..	..	..	..	..	9,657	31,469	2,800	35,829	1,185	4,275	..	4,111	910	3,826	971	1,487	1,258	1,090	5,841	512
Bamboos ..	..	..	..	..	..	..	..	..	135	..	3,380	..	..	..	2,050	..	2,385	..	4,500	100

APPENDIX E.

Revenue and Expenditure in the Goálpára Division from 1875-76 *to* 1894-95.

Budget heads.	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.
REVENUE.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I. a ..	..	11 12 0	3,808 2 4	2,324 10 3	6,665 10 2	6,317 5 1	12,642 11 8	11,839 13 6	..	..	..
II. ..	..	..	..	..	..	522 0 0	982 6 0	..	..	..	..
II. a ..	489 0 0	14,344 0 0	5,609 0 0	2,132 0 0	9,558 0 0	23,913 12 0	29,298 14 0	47,027 11 0	33,407 14 0	13,356 8 0	15,860 15 0
b ..	..	..	59 10 0	66 8 0	1 0 0	17 0 0	0 8 0	24 4 0	12 12 0	36 10 0	27 1 0
c ..	..	..	..	..	..	..	..	42 0 0	131 6 0	..	..
d ..	..	..	..	..	..	7 8 0	..	..	..	..	..
e ..	..	..	..	..	2 0 0	..	2 0 0	347 8 0	531 15 9	202 2 0	123 1 6
III. ..	..	..	21 0 0	..	..	1,903 12 0	..	43 12 0	65 8 0	2 0 0	14 9 0
IV. a ..	..	..	..	366 0 0	..	242 8 0	329 0 0	199 0 0	43 8 0	29 8 0	24 0 0
V. a ..	13 8 0	..	..	..	..	10 0 0	35 0 0	72 0 0	112 0 0	..	560 0 0
b ..	..	..	24 4 0	0 11 3	0 15 0	0 0 6	2 0 0	0 8 0	32 11 9	0 4 0	0 5 8
c ..	..	7 8 0	31 0 0	245 0 0	761 8 6	609 9 6	371 15 11	482 14 6	530 3 0	674 13 3	313 3 3
Total Revenue	502 8 0	14,363 4 0	9,553 0 4	5,134 13 6	16,989 2 5	33,443 7 1	44,164 7 7	60,079 7 0	34,867 14 6	14,301 13 3	16,923 3 5

Revenue and Expenditure in the Goálpára Division from 1875-76 *to* 1894-95—continued.

Budget heads.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Grand total.
REVENUE.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs.	Rs. a. p.
I. a	..	..	..	7,100 0 0	2,158 15 0	4,381 0 0	3,795	17,153	11,848	90,046 0 0
II.	..	..	..	..	..	..	..	..	..	1,504 6 0
II. a	17,051 15 0	34,037 0 0	62,358 0 9	89,969 5 0	60,665 11 9	27,108 5 0	30,905	26,319	13,929	5,57,240 15 6
b	16 4 0	39 10 0	48 1 0	77 13 6	52 13 0	12 8 0	24	84	194	794 6 6
c	..	64 4 6	7 4 6	0 8 0	..	5 0 0	14	3	8	275 7 0
d	..	..	189 8 0	12 0 0	7 8 0	10 12 0	253	241	288	1,009 4 0
e	243 1 0	3,989 2 8	3,346 8 0	3,546 3 9	7,370 9 9	5,933 5 9	3,985	3,546	4,809	37,982 10 2
III.	28 8 0	20 4 0	111 8 0	32 0 0	461 15 6	1,249 9 0	643	350	738	5,685 5 6
IV. a	113 0 0	752 0 0	52 4 0	..	..	..	509	304	340	3,803 12 0
V. a	241 0 0	110 0 0	446 8 0	164 0 0	451 10 0	..	..	10	..	2,225 10 0
b	2 9 0	2 8 0	146 5 4	..	0 14 0	0 8 0	64	14	11	303 9 3
c	752 11 0	837 3 0	1,118 9 3	1,014 0 6	1,834 0 0	1,230 6 4	3,021	2,264	2,472	18,571 10 0
Total Revenue	18,449 0 0	39,852 0 2	67,824 8 10	1,01,915 14 9	73,004 1 0	39,936 6 1	43,213	50,288	34,637	7,19,442 15 11

Revenue and Expenditure in the Goálpára Division from 1875-76 *to* 1894-95—continued.

Budget heads.	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.
EXPENDITURE.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A. I. a ..	..	166 13 6	2,246 2 0	4,757 9 0	7,383 13 0	2,472 8 9	1,454 13 0	217 3 0	..	..	..
e ..	..	..	..	..	..	..	..	..	..	..	..
A. II. ..	..	109 7 3	..	..	..	35 0 0	375 9 3	120 0 0	..	25 12 4	42 15 6
A. III. ..	..	..	5 0 0	6 0 0	..	9 4 0	..	..	..	..	..
A. VI. a ..	..	2,915 0 0	..	..	1,900 0 0	..	..	..	3,900 0 0	..	..
b ..	107 15 3	441 3 3	797 13 9	1,528 1 3	2,583 3 0	1,434 5 9	1,176 7 0	1,097 13 8	1,186 8 9	820 14 1	900 6 9
c ..	81 12 0	748 14 6	331 13 9	442 9 9	639 15 11	504 8 0	237 5 9	339 6 0	173 12 0	372 10 0	114 1 8
A. VII. a ..	..	..	..	35 0 0	6 9 0	6 10 0	78 12 0	20 5 7	23 12 0	..	..
b ..	289 7 0	2,489 10 0	1,924 5 6	1,812 10 3	2,722 1 4	2,259 10 4	2,915 4 8	491 15 3	982 12 4	992 1 0	559 0 4
c ..	..	..	..	..	..	..	..	..	..	..	..
A. VIII. a ..	76 4 0	75 13 0	610 5 9	652 8 0	869 14 9	984 15 3	181 12 6	..	330 14 9	448 13 4	485 15 3
b ..	..	..	..	..	..	..	..	..	..	..	301 7 4
c ..	367 7 3	776 6 9	1,195 5 3	658 3 9	955 14 6	859 5 6	593 3 0	..	512 4 6	869 3 1	53 8 0
d ..	..	..	..	..	..	..	..	..	..	..	..
f ..	23 8 0	322 6 0	1,054 1 6	1,224 15 0	2,228 14 10	1,933 6 9	1,849 5 3	2,347 2 1	3,990 12 8	3,702 15 0	3,884 2 11
g ..	3 0 0	202 6 6	..	..	91 2 9	33 0 0	56 6 0	339 14 3	194 12 11	388 7 11	569 8 0
A. IX. a ..	8 0 0	..	..	..	..	..	71 4 0	..	..	..	421 8 6
b ..	..	42 3 0	329 13 3	162 5 3	268 14 11	322 8 0	441 13 5	509 11 0	507 4 7	923 11 2	569 9 3
c ..	..	..	..	..	..	..	..	..	..	..	..
Total A ..	957 5 6	8,290 3 9	8,498 12 0	10,779 14 3	19,649 8 0	10,856 2 4	9,431 15 10	8,483 6 10	11,802 14 6	8,544 7 11	7,902 3 6

Revenue and Expenditure in the Goálpára Division from 1875-76 *to* 1894-95—continued.

Budget heads.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Grand total.
EXPENDITURE.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs.	Rs. a. p.
A. I. a	..	..	122 8 0	2,912 10 9	3,733 1 0	3,656 7 9	8,495	4,856	3,587	46,061 9 9
c	..	..	..	..	..	..	338	..	..	338 0 0
A. II.	42 4 3	894 3 6	1,111 9 11	1,520 2 0	1,977 15 5	2,278 3 8	2,569	1,369	2,279	14,750 3 1
A. III.	..	..	..	..	..	..	14	..	..	34 4 0
A. VI. a	..	..	..	..	2,000 0 0	..	..	..	..	10,715 0 0
b	737 13 4	913 1 6	787 10 6	1,571 10 3	2,231 8 0	3,858 6 11	5,834	4,888	4,534	37,429 9 0
c	50 6 0	240 14 0	310 8 0	888 5 6	554 12 6	952 12 0	593	893	683	9,133 7 4
A. VII. a	..	..	20 0 0	20 14 0	18 7 10	83 4 0	..	104	11	378 10 5
b	646 15 0	1,210 7 11	1,935 0 0	3,713 10 0	999 13 1	1,256 10 7	1,682	1,956	1,329	31,668 6 7
c	..	..	130 0 0	420 2 6	3 3 6	236 8 0	142	142	138	1,217 14 0
A. VIII. a	162 2 5	290 9 0	176 10 0	234 8 6	222 3 0	309 13 6	671	675	663	8,122 2 3
b	950 0 0	..	..	..	..	..	..	..	..	1,251 7 4
c	66 0 0	..	198 0 0	16,372 4 9	17,001 13 0	22,982 2 11	21,713	4,338	2,847	91,659 2 3
d	..	..	..	..	41 14 6	21 12 0	..	46	294	403 10 6
f	4,345 5 1	4,271 8 1	3,164 13 9	5,125 9 0	8,838 11 6	11,973 11 7	8,166	4,390	3,960	76,797 5 0
g	1,046 7 10	982 3 9	964 3 0	1,879 3 6	1,819 0 6	1,979 3 6	1,060	1,355	1,245	14,209 0 5
A. IX. a	57 4 0	84 6 0	..	50 0 0	..	..	..	..	..	692 6 6
b	540 15 0	329 14 6	..	1 2 0	131 0 9	..	..	..	..	5,079 14 1
c	..	..	583 2 0	354 1 3	382 8 0	317 7 0	284	149	121	2,191 2 3
Total A	8,645 7 11	9,217 4 3	9,504 1 2	35,064 4 0	39,955 11 7	49,136 7 5	51,561	25,167	21,691	3,52,133 2 9

Revenue and Expenditure in the Godlpára Division from 1875-76 *to* 1894-95—continued.

Budget heads.	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.
EXPENDITURE.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
B. I. a ..	..	..	..	..	..	958 1 4	..	..	..	..	..
b ..	2,275 5 9	4,783 5 0	5,135 7 9	6,400 0 0	5,400 0 0	4,951 9 8	4,850 0 0	7,649 14 4	10,950 0 0	4,200 0 0	3,050 0 0
c ..	851 0 0	1,133 5 6	1,061 0 0	2,041 3 0	2,252 0 0	2,152 13 6	2,108 9 3	2,987 8 6	3,645 14 4	4,041 11 6	3,423 0 6
d ..	90 10 6	478 6 6	528 0 0	528 0 0	528 0 0	528 0 0	523 3 3	626 12 0	648 0 0	935 11 4	1,008 0 0
e ..	..	..	..	..	..	..	..	..	..	..	219 2 3
f ..	..	..	..	..	..	..	..	..	..	..	..
B. II. b ..	873 13 0	1,232 2 0	695 0 0	1,118 3 0	959 12 0	1,021 9 0	1,246 14 3	1,173 10 0	1,741 13 0	1,227 4 0	1,479 8 9
c ..	2 0 0	3 12 0	16 15 0	..	..	120 3 9	..	96 5 3	359 0 0	644 5 0	313 12 0
d ..	..	..	1 8 0	..	..	..	..	..	..	..	..
B. III. a ..	..	1 0 0	0 12 0	8 2 0	2 2 0	4 3 0	2 4 0	..	0 12 0	1 0 0	0 12 0
b ..	64 9 0	102 9 3	46 7 0	64 5 0	92 10 6	161 8 0	73 6 0	60 0 0	23 4 0	6 14 0	24 3 3
c ..	..	..	..	100 0 0	..	..	..	..	..	..	24 0 0
e ..	20 0 0	41 7 0	46 11 6	87 11 0	96 7 6	137 10 6	95 14 0	45 8 0	50 7 6	50 9 6	49 6 0
f ..	26 7 3	70 0 6	124 1 9	148 5 0	143 0 3	217 3 9	220 4 0	150 6 3	322 3 3	216 15 1	270 0 2
Total B ..	4,203 13 6	7,845 15 9	7,655 15 0	10,495 13 0	9,474 0 3	10,252 14 6	9,120 11 9	12,790 0 4	17,741 6 1	11,324 6 5	9,865 1 11
Total Expenditure A and B ..	5,161 3 9	16,136 3 6	16,149 11 0	21,275 11 3	29,123 8 3	21,108 0 10	18,552 11 7	18,273 7 2	29,544 4 7	19,868 14 4	17,767 5 5
Surplus or Deficit	—6,686 11 0	—1,772 15 6	—6,596 10 8	—16,140 13 9	—12,134 5 10	+12,335 6 3	+25,611 12 0	+41,805 15 10	+5,323 9 11	—5,567 1 1	—814 2 0

Revenue and Expenditure in the Goálpára Division from 1875-76 *to* 1894-95—concluded.

Budget heads.		1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Grand total.
EXPENDITURE.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs.	Rs. a. p.
B. I.	a	..	..	..	..	..	..	..	..	..	958 1 4
	b .. .	5,793 10 8	5,738 11 4	6,201 5 8	9,050 0 0	7,800 0 0	4,129 3 0	8,424	9,309	11,532	1,37,626 9 2
	c	3,383 8 3	3,223 4 6	3,229 2 0	3,277 14 6	3,253 15 6	3,217 11 3	4,891	4,138	3,571	57,886 10 1
	d	1,008 0 0	1,008 0 0	992 8 3	1,008 0 0	1,008 0 0	1,008 0 0	1,613	1,302	1,228	16,598 8 10
	e	..	..	..	200 0 0	..	677 13 7	..	49	—6	1,139 15 10
	f	..	..	..	..	..	..	..	990	2,152	3,142 0 0
B. II.	b	1,209 3 6	1,607 10 6	1,531 12 0	1,041 4 6	1,535 0 0	714 8 0	2,651	2,550	2,706	28,515 15 6
	c	430 12 0	490 14 0	376 11 0	521 13 0	312 15 0	390 6 0	760	761	514	6,114 12 0
	.. ..	..	..	..	1 8 0	..	..	..	..	2	5 0 0
B. III.	a	..	..	..	..	..	..	..	2	..	22 15 0
	b	25 4 6	30 2 0	11 14 0	9 8 0	..	2 0 0	4	6	42	850 13 6
	c	24 0 0	36 0 0	36 0 0	36 0 0	36 0 0	36 0 0	36	36	36	436 0 0
	e	42 6 0	44 8 0	61 13 0	68 11 0	55 5 6	55 11 0	87	92	114	1,343 3 0
	f	296 8 6	275 15 3	459 6 0	351 15 3	452 11 0	436 4 10	465	611	480	5,737 12 1
Total B		12,416 5 5	12,455 1 7	12,900 7 11	15,566 10 3	14,453 15 0	10,667 9 8	18,931	19,846	22,371	2,50,378 4 4
Total Expenditure A and B ..		21,061 13 4	21,672 5 10	22,404 9 1	50,630 14 3	54,409 10 7	59,804 1 1	70,492	45,013	44,062	6,02,511 7 1
Surplus or Deficit ..		—2,612 13 4	+18,179 10 4	+45,419 15 9	+51,385 0 6	+18,594 6 5	—19,867 11 0	—27,279	+5,275	—9,425	+1,16,931 8 10

Annas and pies are not included during recent years' annual returns, and are consequently omitted from 1892-93.

APPENDIX F.

Statement showing Details of Office and Temporary Establishments.

No.	Depôt or station, etc.	Officer in charge.	Rate of pay per month.	Annual cost.	Remarks.
	(1) *Permanent Office.*		Rs.	Rs.	
1	Divisional office, Dhubri	Head Clerk ...	60	720	
1	Ditto	Second ,, ...	40	480	
1	Ditto	Office peon ...	7	84	
1	Ditto	Post ,, ...	7	84	
	(2) *Temporary Depôt.*				
1	Sale depôt, Bilasipara	Forester ...	20	240	Entertained for 12 months.
	(3) *Temporary Patrolling Establishment.*				
1	Check station, Dhubri	Ditto ...	20	240	Entertained for 12 months.
2	Ditto	Head guard ...	20	120	Ditto for 6 months from October to March.
1	Ditto	Boat with crew ...	25	150	Ditto ditto.
1	Ditto	Ditto ...	25	200	Entertained for 8 months from October to May.
	(4) *Temporary Check Station.*				
1	Check station, Dhubri	Traffic registrar ...	10	90	Entertained for 9 months from October to June.
1	Ditto, ditto	Traffic muharrir ...	5	45	Ditto ditto.
1	Ditto, Fakirganj	Ditto ...	5	45	Ditto ditto.
1	Ditto, Dhubri	Head guard ...	10	90	Ditto ditto.
1	Ditto, ditto	Ditto ...	10	120	Entertained for 12 months.
1	Ditto, ditto	Forest guard ...	7	63	Entertained for 9 months from October to June.
1	Ditto, Fakirganj	Ditto ...	7	63	Ditto ditto.
		Total ...	...	2,834	

List of Trees, Shrubs, and large Climbers found in the Goálpára Forest Division.

Scientific name.	Vernacular name.	Remarks.
Dillenia Indica ...	*Ass.* Otenga ...	Exists in small quantities only in evergreen forests, and along margins of streams. Does not grow to any great size in this division. Fruit sometimes eaten by villagers; elephants are fond of it. Timber fit for firewood and charcoal, and stands submergence well.
„ Pentagyna...	*Ass.* and *Mechi.* Akshi.	Grows in great abundance and size throughout all Sâl-clad areas, mixed and deciduous forest. Persists through fires. Leaves used as plates. Wood makes a good charcoal.
Michelia Champaca...	*Ass.* Titasappa; *Mechi.* Champa.	Found in mixed and evergreen forests, but not in large numbers. Has been greatly in demand for boats, though exported in the form of *dhums* (6 to 7 feet logs) of recent years. Attains great dimensions, 12 feet in girth, but very subject to heart rot. A good timber, which should be valuable for furniture and general purposes.
Liriodendron Tulipiferum.	*Ass.* Champa ...	Common throughout the district, but does not grow wild; cultivated. Not used except the flowers for festivals.
Anona squamosa ...	*Ass.* Ata ...	Cultivated for fruit, but on a small scale only.
Tinospora cordifolia	*Bg.* Golancha	Climber, uncommon in the district, elephants like it as fodder.
Gynocardia Odorata...	.....	Found in mixed forests in small quantities. Oil occasionally extracted from seed.
Tamarix ...	.....	Common along *churs* of Brahmaputra river-banks, and low lands connected with it.
Garcinia pedunculata	*Ass.* Borthekra	Found in mixed forests, but not to any great extent. Not used locally.
Mesua ferrea ...	*Ass.* Nahor ...	Not found growing in this district, except where cultivated as an ornamental shrub. Some mistake in Gamble's specimen E2809, E. Duars, Assam; probably the Gáro Hills supplied the specimen.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division —continued.

Scientific name.	Vernacular name.	Remarks.
Schima Wallichii ...	*Mechi.* Gugera	A very large tree. Grows in great abundance in mixed forests along the foot of the Bhutan Hills, and is found associated liberally with Sâl, where the latter is not absolutely pure. Wood very hard, and used for canoes, husking mills, etc.
Shorea robusta ...	*Mechi.* Sâl ...	The characteristic tree of the district. Grows in pure gregarious masses, generally with the smallest possible element of the usually-associated species. Is encroaching rapidly on mixed forests and grass lands. Does not usually attain dimensions exceeding 6 feet in this district. Is largely exported in the form of *dhums* and poles. Large timber small in quantity to proportion of area. Resin almost absent. A special working scheme prepared for these forests.
Hibiscus macrophyllus	*Gáro* Mao ...	Plentiful in mixed forests under the Bhutan Hills. Is not used in this district, but is exported from the Sumeswari Valley, Gáro Hills.
Kydia calycina ...	*Mechi.* Moshangan.	A small tree, of no importance, found in mixed forests.
Bombax malabaricum	*Bg.* Simul ...	Grows to a great size and extensively amidst Sâl, mixed or deciduous forests. Persists through fires, and is good standing in water. Makes good tea-boxes, and is converted into canoes. This tree is extending rapidly in grass lands. Neither gum nor cotton are collected for local use or export.
Sterculia alata ...	*Mechi.* Baralaiphanzeh.	Found in deciduous and mixed forests, but not used.
„ Urens (?) Villosa (?)	*Ass.* Udal ...	Grows to a great size, and is well scattered in either Sâl, mixed or deciduous forests. Has no use as a timber tree, but the bark is used freely as a fibre.
Grewia sapida ...	.....	Under-shrub, very common on all grass lands.
„ scabrophylla .	*Mechi.* Kokursida.	Small tree, common in mixed forests.
„ vestita ...	„ Pershuajelah	Ditto ditto.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division —continued.

Scientific name.	Vernacular name.	Remarks.
Elœocarpus Varunua	*Ass.* Talkali, Salkuri.	Small tree, common in mixed forests.
Ægle Marmelos ...	*Bg.* Bael ...	Cultivated near by village sites occasionally.
Ochna pumila ...	.....	Under-shrubs, very common throughout the district.
Garuga pinnata ...	*Mechi.* Gia, Jia	Fairly common in mixed forests, but not much used.
Canarium Bengalense	*Ass.* Dhuna ...	Found in mixed forests, near the hills. Not plentiful, nor is it used here.
Melia Indica ...	*Hind.* Nim ...	A few scattered trees planted in the district.
„ Azedarach ...	„ Bakain	Ditto ditto.
Dysoxylum Hamiltonii	*Ass.* Gendelli Poma.	Found in mixed forests, but scarce. Not used locally.
Amoora spectabilis ...	*Mechi.* Pat amari.	Large tree, found in mixed forests and near river banks. Comparatively scarce. Exported in the form of boats.
Swietenia mahageni...	.....	A few of these trees are cultivated at Bogribari, but are not flourishing.
Chickrassia tabularis	*Ass.* Boga Poma.	Found in mixed forest, but not plentifully, and not in demand.
Cedrela Toona ...	*Ass.* Poma ...	Ditto ditto.
Zizyphus jujuba ...	*Hind.* Ber ...	Fairly common in waste places along roads, village sites, etc. Fruit eaten ; otherwise not used.
Œsculus punduana ...	*Ass.* Kun kirkola.	A small tree, plentiful along watercourses and in low lands. Wood not used.
Sapindus attenuatus...	*Mechi.* Tigropt	Small tree, uncommon, and not used.
Nephelium Litchi ...	Litchi ...	Cultivated for its fruit very successfully, but only in zemindárs' own gardens. Not generally cultivated.
Turpinia pomifera ...	*Mechi.* Ban Dileri.	In mixed forests ; small and not common.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Meliosma simplicifolia	*Ass.* Dibri; *Mechi.* Laigongron koko.	In mixed forests. Not used locally or for export.
Mangifera Indica ...	*Ass.* Am ...	Cultivated, but only to a small extent.
„ Sylvatica ...	*Mechi.* Bagual	Very uncommon.
Anacardium occidentale.	*Bg.* Hijuli ...	A few cultivated in Dhubri.
Semecarpus anacardium.	„ Bhela ...	Fairly common in deciduous and mixed forests. Wood not used, but fruit is occasionally used as food.
Spondias mangifera...	*Ass.* Amra ...	Scattered in deciduous forests, and sometimes found near village sites. Wood valueless, but fruit sometimes eaten.
Moringa pterygosperma.	*Bg.* Sujuna ...	A few trees cultivated near village sites. Fruit used.
Indigofera pulchella(?)	.....	Shrub; very common in Sâl forests, where cover is dense and soil poor.
Millettia auriculata ...	.....	Very common climbing shrub, growing in complicated masses in Sâl and mixed forests, where canopy is uninterrupted.
„ *sp.* ...	.....	Ditto ditto.
Abrus precatorius ...	.....	Climber, in mixed or deciduous forests, chiefly latter. Not common.
Mucuna imbricata ...	*Bg.* Kasi ...	Climber, in deciduous forests. Not common.
„ pruriens ...	„ Alkusa ...	Ditto ditto.
Erythrina Indica ...	*Ass.* Madar ...	Not found wild. Grown in hedges round village sites. Wood not used.
Spatholobus Roxburghii.	*Bg.* Salmama...	Large climber, found extensively in Sâl and all forests.
Butea frondosa ...	*Mechi.* Palashu	A small tree, uncommon, found in grass lands and deciduous forests, generally near water.
Cajanus indicus ...	*Bg.* Arhar ...	Cultivated shrubs, but not to any extent.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Dalbergia Sissoo ...	Sisu ...	A good-sized tree; grows gregariously and mixed with *Acacia catechu*, which it seems to drive out. Extending rapidly along and near banks of most rivers in the district. Fair demand for standing trees and dead wood, exported for furniture, naves, and felloes of wheels. A somewhat heavy wood, but floats when seasoned.
„ Stipulaceœ ...	*Mechi.* Garodosal.	Climbing shrub, common in Sâl forests.
Derris scandens ...	.....	Ditto ditto.
„ robusta ...	*Ass.* Mowhitta	Not common; found near river banks.
Poinciania regia ...	.....	Cultivated in Dhubri and some of the zemindáris for ornamental purposes.
Cassia fistula ...	*Ass.* Sonaru ...	Very little found in this division.
Bauhinia acuminata	*Bg.* Kanchan...	Shrub; uncommon in this district.
„ tomentosa...	„ „ ...	Shrub or small tree; cultivated for ornament.
„ vahlii ...	.....	Climber; only observed amidst scrub at Bhumeswar Hill.
„ malabarica	*Ass.* Kattra ...	Generally a small tree. Fairly common in mixed forests under the hills or along river banks.
„ variegata...	*Mechi.* Kurmang	Ditto ditto.
Tamarindus Indica ...	*Ass.* Teteli ...	Cultivated to a small extent.
Entada scandens ...	*Bg.* Gila ...	Climber, found in mixed forests. Not used locally.
Mimosa pudica ...	.....	.....
„ rubicaulis ...	.....	.....
Acacia catechu ...	*Ass.* Khair ...	Grows gregariously or associated with *Dalbergia Sissoo*, and is extending along banks of all rivers in the division. Is being much damaged by inundation, and the larger specimens are uncommon. Cutch not made locally. Experiments made departmentally cost three times cost of production. A hard wood, and dead poles much used as house posts locally.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Albizzia procera ...	*Ass.* Korai ...	A good wood, and assumes big dimensions. Found chiefly in deciduous forests and grass lands. Not very common, but is extending in the vicinity of the Sankos and Pekua rivers.
„ Stipulata ...	*Ass.* Sau ; *Mechi.* Bansobri.	Scattered in deciduous forests and grass lands, but very sparingly.
Pithecolobium saman	.....	A few planted specimens.
Terminalia belerica...	*Ass.* Bhaora ...	Grows into a fairly big tree, and is distributed largely throughout the district, being found in all descriptions of forest and grass lands. Neither wood nor myrabolams used.
„ chebula or citrina.	*Bg.* Haritaki...	Fairly common in most forests, but specially favours grass lands, and is growing rapidly and almost exclusively over such areas in the Muktaigaon, Maula, and Janali blocks. Neither wood nor myrabolams used.
„ tomentosa	*Hind.* Saj ...	A large tree, not common, and confined to mixed forests in the immediate vicinity of the hills. Timber not in demand here.
Eucalyptus globulus...	.....	A few cultivated specimens at Bogribari.
Psidium guava ...	*Ass.* Modhuriam	A few trees are cultivated in village sites.
Eugenia formosa ...	*Mechi.* Bankonkri.	These trees are very common, and are found in all descriptions of forest and grass lands. Low-lying places are favoured. The wood is valueless, and not in demand.
„ obovata ...	„ Bodajam	
„ jambolana...	„ Korjam	
Careya arborea ...	*Hind.* Kumbi...	A small tree, associated largely with Sál and found in deciduous forests. Persists through fires; is valueless as a timber.
Melastoma Malabathricum.	*Mechi.* Shapti...	Very common shrub, along watercourses chiefly.
Lagerstrœmia Indica	.....	Shrub; cultivated.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Lagerstrœmia parviflora.	*Mechi.* Shida...	Large tree, very common, much associated with Sál, and found plentifully scattered in mixed forest. Not in demand here, but should make good planks, tea-boxes, etc.
„ Flos-Reginæ.	*Bg.* Jarul ...	Good wood, but does not attain any great length in this district, nor is it common, except along streams or in their vicinity. Has been occasionally extracted in the form of *dhums* or boats.
Duabanga sonneratoides.	*Ass.* Khokan...	Very few specimens in this district, and those confined to damp regions and mixed forests.
Carica papaya ...	*Hind.* Papaya	Cultivated in a few places.
Opuntia Dillenii ...	„ Nagphana	Cultivated in village sites, and sometimes found in the forests so cultivated for religious purposes.
Mussœnda frondosa...	.....	Found in small numbers only.
Anthocephalus cadamba.	*Mechi.* Kadam	Only cultivated specimens are found.
Adina cordifolia ...	*Nep.* Karam ...	Not many specimens, and these are found on outside margins of mixed forests or in deciduous forests.
Randia dumetorum...	*Mechi.* Gundrau	Shrub or small tree, very common in waste places, as well as in mixed forests. Fruit used to poison fish.
Coffea bengalensis ..	*Mechi.* Kundrudi	Shrub grows everywhere; berry used as coffee by Mechis sometimes.
Morinda augustifolia	*Ass.* Asugách	A few specimens only found. Yellow dye extracted by Mechis.
Diospyros embryopteris.	*Bg.* Gab ...	A few planted trees only.
Thevetia neriifolia ...	.....	Cultivated near village sites.
Holarrhena antidysenterica.	*Mechi.* Dudhkuri.	Very common throughout the district.
Calotropis gigantea ...	.....	A few specimens found in waste places.
Solanum jacquinii ...	.....	Common in waste places.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Oroxylum indicum ...	*Mechi.* Cherpong, Ding-dinga.	Scattered throughout the district. Only used for curing elephant sores.
Stereospermum chelonoides.	*Ass.* Paroli; *Mechi.* Sirpang.	Grows extensively in grass lands and in deciduous forest. A big tree, and quality of wood good, but not used in this district.
Thunbergia grandiflora.	.....	A common climber in all forests.
Adhatoda vasica ...	*Mechi.* Bahuka	Shrub, found wild and plentifully everywhere; is cultivated round almost every village of the district. Leaves are used in curries, and an oil is expressed. Nothing known of it as an insecticide here.
Lantana, *sp.* ...	.....	Shrub, common in various parts of the district.
Callicarpa arborea ...	*Mechi.* Kozo ...	Spread, but not plentifully, and is not used.
Tectona grandis ...	*Hind.* Sagun...	A few trees cultivated in stations.
Gmelina arborea ...	*Mechi.* Gambhari	A good wood, scattered in various forests, but far from plentiful, and is not used.
Vitex altissima ...	*Ass.* Ahay ...	Only small specimens, and few of them found in this district.
Clerodendron infortunatum.	*Mechi.* Lukuna	Shrub, very common in most forests and in waste places.
Holmskioldia sanguinea.	.....	Shrub, straggling, found chiefly near the hills and in poor soil.
Cinnamomum glanduliferum.	*Mechi.* Gunserai	Scattered, but not plentiful in mixed forests. A little exported in the form of boats. A good timber tree.
Machilus odoratissima	*Ass.* Soom ...	Very little in the district, and that possibly originally cultivated.
Tetranthera monopetala.	„ Sualu ...	Ditto ditto.
Grevillea robusta ...	.....	Planted in a few places.
Artocarpus integrifolia	*Bg.* Kuthal ...	Cultivated in a large number of villages.

List of Trees, Shrubs, and large Climbers found in the Goálpára Division—continued.

Scientific name.	Vernacular name.	Remarks.
Artocarpus lakoocha	*Ass.* Dawa ...	Cultivated in a large number of villages.
„ chaplasha	„ Sam ...	Large tree, and timber good. Grows in mixed forests near streams and in the moister regions. A fair export of this timber in the form of boats and logs.
Ficus bengalensis ...	„ Bur ...	Some fine planted specimens near old village sites.
„ religiosa ...	„ Pakar ...	Ditto ditto.
„ cordifolia ...	„ Pakri ...	Ditto ditto.
„ elastica ...	„ Atta Bur	The remains of a very few specimens only met.
„ hispida ...	*Mechi.* Dumur	Very common on river banks and in grass lands; also grows near village sites. Good elephant fodder.
„ acutifida ...	„ „	Ditto ditto.
Sponia orientalis ...	„ Param	Found in mixed forests, generally of a poor description.
Phyllanthus emblica	*Ass.* Amluki ...	Common in every description of forest. Wood valueless, and myrambolams seldom used.
Bischoffia javanica ...	„ Uriam ...	Very common, but not generally of great size, along banks of streams, particularly where little other timber is found. A good wood, stands water well, but not used here, nor exported.
Briedelia stipularis ...	„ Kohilata	Climbing shrub, common throughout the district.
„ retusa ...	„ Kohi ...	Only small specimens found here, and not used. In Sâl and deciduous forets.
Mallotus philippinensis.	„ Padam ...	Found in deciduous forests, and sometimes in grass lands near water.
Macaranga Indica ...	„ Modala ...	Small and useless. Grows gregariously on abandoned cultivation, village sites, etc.
„ Gummiflua	„ „ ...	Ditto ditto.
„ peltata ...	.....	Ditto ditto.

List of Trees, Shrubs, and large Climbers found in the Goalpara Division—concluded.

Scientific name.	Vernacular name.	Remarks.
Ricinus communis ...	.....	Cultivated in most village sites, and sometimes found amongst waste in forests, possibly the abandoned sites of villages. The cultivation is primarily for the *Antherea Assama*.
Excœcaria baccata ...	*Ass.* Adamsali	A few specimens only found in mixed forests, close under the hills.
Salix tetrasperma ...	„ Bhi ...	Very common in marshy places and along river banks. Not used.
Engelhardtia spicata	„ Rumgach	Found along margins of mixed forest and in it, but not plentifully.
Cycas pectinata (?) ...	.....	Fairly common in Sâl forests.
Borassus flabelliformis	.....	Cultivated specimens found.
Licuala peltata ...	*Ass.* Pati ...	A few specimens only found in dense cover and marshy places.
Phœnix acaulis ...	.....	Found in Sâl forests and grass lands.
Areca gracilis ...	*Ass.* Ranga ...	Not plentiful. Found in damp places of evergreen and mixed forests.
„ catechu ...	*Hind.* Supari...	Cultivated.
Arenga saccharifera	*Ass.* Sáo ...	A few specimens found in mixed forests.
Cocos nucifera ...	*Bg.* Narikel ...	Cultivated in some places.
Bambusa tulda ...	„ Tulda, *Ass.* Jati.	Cultivated round most villages, and sometimes found in the forest, but possibly where village sites pre-existed.
„ balcooa ..	„ Bhuluka	Cultivated, but not extensively.
„ Spinosa ...	„ Koto ...	Cultivated around old villages in the south-east corner of the district, north of the Brahmaputra.
Dendrocalamus Hamiltonii.	„ Kakua ...	Found wild to a small extent only.

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Dhubri,

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FOREST MANAGEMENT

IN THE

GRAND DUCHY

OF

BADEN.

BY

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CALCUTTA:

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.

1896.

FOREST MANAGEMENT IN THE GRAND DUCHY OF BADEN.

A.—Statistics regarding the country generally.

The area of the Grand Duchy of Baden is 15,081 square kilometers (or about 5,800 English square miles) of which 16 per cent. is level country along the right bank of the Rhine, 40 per cent. hilly, and 44 per cent. mountainous. The elevation varies from 89 m. (on the Rhine, near the border of Hesse Darmstadt) to 1,495 m. above sea-level (on the Feldberg). Area. Configuration. Elevation.

Almost every geological formation is represented. Gneiss, granite, porphyry, and Buntsandstein form the principal rock in the Black Forest area; elsewhere muschelkalk and keuper, jura, molass, etc., prevail. Geological formations.

The climate varies greatly according to the locality, passing through every degree from mild to very rough, but may be described generally as temperate. It is evident, therefore, that in proportion to the area of the country very great diversity exists in elevation, soil, climate, and consequently also in the forest vegetation. Climate.

The population is 1,656,817, or 110 per square kilometer (equivalent to 286 per English square mile). The area per head of population is thus ·9 hectare. Population.

B.—General description of the Forests.

1. *Forest area.*—The forests occupy an area of 5,459 square kilometers,* or 36·2 per cent. of the entire area of the country. Baden is one of the best-wooded States not only in Germany, but in the whole of Europe. Excluding some of the minor German States of small area, no European country except Sweden and Norway (with 39 per cent. forest area) possesses so large a percentage of forest area. Per head of population the forest area is ·33 hectare. Forest area.

2. *Proprietorship and Control.*—The greater part of the forests is in possession of Communes and private proprietors, as appears from the following statement:—

Proprietorship.	Forest Area.	
	Hectares.	Percentage.
The State	95,944	17·6
Communes	250,728	45·9
Corporations	18,939	3·5
Private proprietors	180,299	33
Total	545,910	100

* Excluding the area of that part of the Lake of Constance which belongs to Baden.

State control.

All forests belonging to Communes, Corporations, and private proprietors are subject to State control. The Forest officers entrusted with the charge of the two first-mentioned classes of forest are all either appointed directly by the State, or where the proprietary body is permitted to select its own officers, their appointment is subject to approval and confirmation by the State, and all Working-Plans are subject to State regulation. No private forest may be totally disafforested, nor its existence endangered by palpable mismanagement. Clear cutting may not be practised without special permission of the State (exercised through a central Board of Control), if the area exceeds one hectare. These regulations are of practical importance mainly in the Black Forest. Permission for clear felling is granted only under precautions for prompt restocking; before commencement of clear felling the proprietor is bound to furnish adequate money security, the amount of which must cover the estimated cost of artificial restocking, and the felling may not be extended over fresh areas until the cultural operations in the portions previously cleared have been successfully accomplished. Direct contravention of the law in these respects is punishable not only with heavy fine, but even with imprisonment which may extend to six months.

3. *Elevation.*—The elevation of the forests ranges from 95 m. to 1,880 m. above sea-level. Of the total forest area, 3·8 per cent. is situated at an altitude over 1,000 m.; 32·9 per cent. between 500 and 1,000 m.; and 63·3 per cent. below 500 m.

4. *Climate.*—The climate is mostly mild and temperate, and more rarely rough; on the whole it is very favourable to forest vegetation.

5. *Rock-formation.*—The principal formations underlie forest areas in the following proportion:—

	Per cent.
Granite and gneiss	26·9
Buntsandstein	27·4
Diluvial and alluvial formations	13·6
Muschelkalk	12·4
Other formations, such as keuper, porphyry, clay slate, basalt, etc.	19·7
Total	100

6. *Species.*—About one-half of the growing stock is composed of deciduous trees, and the remainder of conifers. The proportions are as follows:—

	Per cent.	Per cent.
Beech	26·4	
Oak	11·1	
Other deciduous trees, such as alder, ash, elm, maple, etc.	14·1	
Carried forward		51·6

	Per cent.	Per cent.
Brought forward		51·6
Spruce	20·8	
Silver fir	13·6	
Scotch Pine	13·6	
Larch	·4	
		48·4
Total .		100

C.—System of Management.

1. *Organisation.*—The entire forest area, including even forests belonging to private proprietors, is divided into 102 Circles, the areas of which are very variable, ranging from 1,384 to 6,567 hectares. Excluding private forests, the average area is 3,584 hectares. Each Circle is controlled by an "Oberförster," usually assisted by one or two Forest Apprentices; and every Oberförster is directly subordinate to a central Board of Control ("Domänendirektion") at Karlsruhe, which consists of a President and ten members, of whom five have received professional forest training, and bear the designation of "Forstrath" or "Oberforstrath". It is part of the duty of the Forest Members to make two principal personal inspections during every decade in each Circle within their jurisdiction: once at the decennial Working-Plan Revision, and once during the course of the decade. Minor inspections are repeated as often as the importance of the Circle, the method of treatment, and the personality of the Oberförster, may necessitate. For purposes of inspection a certain number of Circles, about 20 on an average, is allotted to each Forest Member, and these Circles are distributed in small groups over the whole country, so that each member maintains an intimate acquaintance with all the different classes of forest and the various methods of treatment.

Forest Circles. Establishment. Board of Control. "Forsträthe."

Before appointment as Forest Apprentice, candidates must undergo a course of academical training extending over at least 3½ years, and must then pass the State examinations; and before promotion to the rank of Oberförster, Apprentices must have at least two years' active service in a Forest Circle. The Forest Members of the Board of Control are selected from the class of Oberförster.

Professional training.

2. *Leading principles of management.*—In all forests belonging to Communes and Corporations, no less than in the State forests, and even in a large portion of the private forests, the principal aim of management is not merely to derive the largest possible net income from the forests, but also to produce that special class of material which is most suited to the requirements of the population at large. In accordance with this fundamental principle, the production of large-sized building timber is specially favoured, and the preference is given to conifers (mainly Spruce and Silver fir) wherever the locality is suitable.

Consideration for requirements of the population. Production of large-sized timber.

During the past 40 years the percentage of timber in the outturn has risen from 19 per cent. to 33 per cent., as the direct result of the general application of these principles.

High Forest treatment.

In order to produce timber of the largest size, long rotations and occasional reservation of suitable standards for a second rotation, are necessary, and hence the High Forest treatment with prolonged regeneration periods is adopted wherever possible. Mainly with the object of minimising danger from snow, storms, and insects, mixed woods are desired, importance being attached to due maintenance of the Beech (which already forms a very large proportion in the composition of the growing stock of most of the Baden forests) in consequence of its great value in preserving and improving the quality of the soil, and assisting the production of large timber of other species.

Mixed woods.

Cleanings and thinnings.

Cleanings are carried out from an early stage of the forest development, in which valuable species capable of producing large timber are favoured at the expense of soft-wooded and undesirable species. These cleanings are continued in the pole stage in the shape of thinnings, which aim at the removal of badly-shaped, cankerous, diseased trees. These operations are, therefore, not carried out for the sake of temporary financial profit (as is often done elsewhere), but with a purely sylvicultural object tending to the ultimate production of a large yield of valuable timber.

3. *Methods of Sylvicultural treatment.*—The various methods of sylvicultural treatment are in force respectively in the following percentages of area :—

	Per cent.
Clear cutting (usually in Scotch Pine woods, etc.) . .	12·3
*Natural regeneration under shelterwood ("Schirmschlag")	32·1
*Natural regeneration with prolonged regeneration periods ("Femelschlag")	20·5
Selection system	8·9
Under conversion from coppice into high forest . .	6
Total High Forest .	79·8
Coppice with standards	12·8
Simple coppice	7·4
Total .	100

* The difference between "Schirmschlag" and "Femelschlag," as understood in Baden, appears from the following description :—

(a) In "Schirmschlag" purely sylvicultural considerations prevail, the aim being to secure complete natural regeneration as rapidly as possible.

(b) "Femelschlag," on the other hand, aims not merely at complete natural regeneration, but also at securing material increment in the trees of the shelterwood during the final stages of the regeneration fellings, and therefore prolongs the regeneration period beyond the time required merely in the interests of complete natural regeneration. "Femelschlag" is therefore nothing but somewhat irregular "Schirmschlag," with a prolonged period of regeneration.

4. *Rotation.*—In the High Forest treatment the rotation ranges from 60 to 150 years, 80 per cent. of the area being worked on a rotation of 100 to 120 years. In coppice with standards, the rotation varies between 8 and 40 years, the average being 25 years; and in simple coppice it ranges from 5 to 30 years, with an average of 15 years.

Regulations regarding Working-Plans.

5. *Working-Plans.*—By a law passed in 1833, and subsequently amended, a period of 20 years was fixed within which the preparation of a complete Working-Plan for every forest belonging to the State, to Communes, and to Corporations was made compulsory. Instructions issued under that law at first prescribed, in the case of High Forest, the principle of an approximately equal periodic yield, and required the preparation of Working-Plans dealing with the whole period embraced in the maximum rotation. In the case of coppice treatment, the system based on area was prescribed.

Periodic revisions at intervals of 10 years.

In 1849 a new instruction was issued limiting the period to be dealt with by the Working-Plan to 10 years, and leaving the Working-Plan Officers to select the appropriate method of determining the annual yield.

Adoption of Heyer's method.

Experience gradually led to a preference for Heyer's method as being best suited to the system of high forest with a prolonged regeneration period ("Femelschlag"), and in 1869 the adoption of that method was universally prescribed. Forests treated as coppice with standards were usually worked strictly by area; but in 1884 an order was issued prescribing that the annual yield be fixed according to volume on the basis of determination of the increment, wherever this appeared necessary for ensuring a sustained yield.

Yield in coppice forests determined by volume.

Scope of Working-Plans.

The existing law requires a revision of every Working-Plan to be made every 10 years, and prescribes that while the revision is to be as simple as possible, all matters of permanent value are to be recorded in a volume of statistics to which a history of the forest and yield tables are to be appended. Thus the statistical volume is opened once only and always kept up to date, while the practical part of the Working-Plan is completely renewed every 10 years.

Working-Plan Agency.

Working-Plans are prepared by the local "Oberförster" assisted by a "Forsttaxator" selected from the class of Oberförster or from the senior apprentices, the services of a junior apprentice being added whenever necessary. Their work consists mainly in the following :—

Work preliminary to preparation of Working-Plan. Changes in area, and deviations from previous plan.

(*a*) Preparation of a statement showing changes in area which have taken place during the previous decade; and a statement of deviations from the previous Working-Plan, with the results of working of the past decade.

Examination of previous plan, and comparison with actual conditions.

(*b*) Careful examination of the previous plan, with the object of ascertaining whether the division into compartments requires any alteration; whether areas, localities, and growing

stock are correctly described; in how far the calculation of volume and increment have been verified by actual results; what influence the management of the past decade has had on the forest; whether, and to what extent, the principles laid down in the previous plan have been followed, and whether any alterations have become necessary. The existing condition of the forest must be ascertained; the principles which are to govern the future treatment, the fellings, cultural operations, etc., to be carried out during the ensuing decade must be determined, and the results of the whole examination must be recorded in the revision.

Future principles and operations determined.

Determination of volume of growing stock.

(*c*) The volume of the growing stock in regeneration coupes, and in areas to be exploited during the next decade, must be determined by actual measurement—valuation surveys of sample plots sufficing in the case of fully-stocked woods, and estimates (with the aid of yield-tables) in the remaining areas.

Normal and real increment.

(*d*) The normal and real increment must be determined. In the case of the shelterwood in regeneration coupes, the increment is calculated in percentages of the existing stock.

Method of determining the yield.

(*e*) The yield is calculated on the basis of the real increment. If the real growing stock exceeds the normal, more than the real increment is fixed for utilisation, provided that utilisation of the excess be desirable from sylvicultural and economic considerations. If, however, the normal growing stock has not yet been reached, less than the real increment is prescribed for exploitation. In the latter case a normal volume of the growing stock is sought to be attained as speedily as possible by saving a portion of the actual increment—and it is expressly laid down that this desirable equalisation should not occupy a longer period than one rotation.

Calculation of normal growing stock in High Forest, and in Coppice Forest.

The volume of the normal growing stock is calculated by multiplying the normal increment by half the number of years in the rotation, in the case of High Forest—and for coppice with standards, by corresponding addition of the normal volume of the standards. In simple coppice the yield of annual coupes is determined merely according to the area of exploitation, and not according to volume.

Division of Working-Plan into sections. General.

The working-plan is divided into sections dealing with —

(*a*) Area; locality; species; method of treatment; rotation; sylvicultural principles; and calculation and utilisation of the yield.

Description of compartments.

(*b*) Description of compartments, in tabular form, indicating area; growing stock; volume according to age classes; real

and normal increment. The results, so far as they can be expressed in figures, are totalled, and a comparison given of actual volume, age classes, and increment with the corresponding normal condition.

Detailed prescriptions for 10 years.

(*c*) A tabular statement showing block, compartment and sub-compartment; kind of felling and of cultural operations; estimated principal and intermediate yield; area of cultural operations; length of roads and trenches—prescribed for the whole decade.

Litter utilisation.

(*d*) A statement of litter utilisation, showing compartment, age, area, number of utilisations of litter admissible during the decade, total area in which litter may be utilised.

Sanction of Working-Plan.

When the revised plan is ready, it is examined by the responsible member of the Board of Control, whose approval is necessary before it can be put in force. A control book is kept up, showing the Working-Plan prescriptions and the actual execution.

Volume of Statistics.

The volume of statistics serves the purpose of simplifying the decennial revisions, of avoiding repetition of local conditions of a permanent character, and of affording precise record regarding the history and yield of the forest. It is divided into three sections, dealing with—

(1) History—including proprietorship, unusual occurrences, administration, etc.

(2) Description—

(*a*) area; boundaries; boundary-marks; rights and privileges; taxes, etc.;

(*b*) topographical features, *e.g.*, situation, soil, climate, vegetation, etc.;

(*c*) management—method of treatment; species; rotation; cutting series, etc.;

(*d*) utilisation—principal felling; thinning; area of exploitation; market rates; etc.;

(*e*) Transport.

(*f*) Forest protection.

(*g*) Hunting and shooting.

(3) Yield—in material and money.

The statistics are written up at the end of each decade by the Working-Plans Officers charged with the duty of revision.

Extent of State Control, and principal regulations.

6. *Forest law.*—Legal enactments dealing specifically with the forest area have been in force since 1833, various amendments having been made from time to time, the latest and most important being that of 1879. The forest law is exceedingly well adapted to the circumstances of the country, and might well serve as a model elsewhere. Mention has already been made of the fact that the law reserves to the State the right

of control of all forests, under whatever proprietorship; and that for Communal and Corporation forests the appointment of Forest Officers rests with the State; and that even in private forests gross mismanagement endangering the permanent maintenance of the forest is not permitted, nor clear cutting allowed without adequate and stringent precautions for their prompt restocking. Working-Plans for all except private forests require approval by the State, and the law prescribes that no portion of any forest is to be allowed to remain blank, and that every forest must be demarcated, surveyed, boundary descriptions prepared, and (except in private forests) the possibility of the forest must be properly ascertained and a sustained yield ensured.

Cattle pasture and grass cutting.

In High Forest, cattle pasture and grass cutting is permitted only after the forest has reached an age of 35 years in the case of deciduous woods, and 30 years in the case of conifers; in coppice woods, it is not allowed before the age of 12 years in the case of soft woods, and of 25 years in the case of hard woods. Litter and moss may not be collected in High Forest before 40 years of age in deciduous, and 30 years in conifer woods; nor in coppice before 12 and 15 years as regards soft and hard-wooded species respectively. Within three years immediately preceding exploitation felling, litter and moss may not be removed at all. Where litter collection is allowed, it may be removed only on certain fixed days, and never in two consecutive years from the same area.

Litter and moss collection.

Suitable measures for prevention of forest fires, of injury by insects, and in many other important respects, are also prescribed by law. Among these may be mentioned the section dealing with forest rights, which empowers every forest proprietor to demand extinction of rights on payment of adequate compensation. Money payment suffices in the case of pasture and litter rights, etc., but for the extinction of wood-rights the sacrifice of a portion of the forest estate itself may be necessary.

Extinction of forest rights.

Illicit cattle-trespass.

Illicit trespass of horses, asses, cattle, goats, sheep, and pigs is punished by fine of one mark (1 shilling) per head. If the trespass occurs in specially-closed coupes, this fine is trebled.

D.—Yield and Financial Results.

Since 1876 the following increase has taken place in the yield and annual increment, per hectare, of the several classes of forest :—

Class.	Increase in yield per hectare.	Increase in annual increment, per hectare.
State	10·9 per cent.	5 per cent.
Communes and Corporations . . .	18 „	3 „

According to the Working-Plans in force in 1888, the growing stock, annual increment, and yield per hectare were as follows, in cubic meters: —

Class.	Volume of growing stock.	Annual increment.	Yield.		
			Principal.	Intermediate.	Total.
State, Communal, and Corporation Forests.	211	4·5	3·6	·8	4·4

The wood-production per head of population amounts to 1·28 cubic meters per annum.

The following summary exhibits the annual yield in material and in money, of each class of forest, in accordance with the condition existing in 1888 :—

Proprietorship.	Productive forest area in hectares.	Volume of growing stock in cubic metres.		Increment in cubic metres.		Yield (principal and intermediate) in cubic metres.		Net income in Marks.	
		Total.	Per hectare.	Total.	Per hectare.	Total.	Per hectare.	Total.	Per hectare.
State	88,701	20,718,098	234	404,181	4·6	420,874	4·7	2,255,703	25·43
Communes and Corporations .	261,182	53,134,119	203	1,155,897	4·4	1,227,556	4·7	6,545,224	25·06
Large private proprietors . .	61,730	13,025,030	211	277,785	4·5	290,131	4·7	1,569,794	25·43
Small „ . „ . .	115,954	10,435,860	90	220,313	1·9	234,227	2	1,234,910	10·65
Total .	527,567	97,313,107	184	2,058,176	3·9	2,172,788	4·1	11,605,631	22

G. I. P. C. O.—No. 118 R. & A.—7-10-96.—500.—R. D. Silver.